

SEP 19 1922

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A comprehensive Directory of the leading machinery and supply manufacturers arranged for the convenience of contractors, engineers, water-works superintendents, municipal and county engineering departments, street and highway officials, city managers, etc., and public officials who may desire to secure catalogs or prices on construction equipment. Where the name of a manufacturer is preceded by a star (\*) it indicates that the user of the directory may secure further information by referring to the manufacturer's advertisement in this issue. The index to advertisers will be found on page facing the inside back cover.

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*View of a Dunn-Built Road*

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EASY ON A TRACK THE CLETRAC WAY

## THE CLEVELAND TRACTOR COMPANY

*Largest Producers of Crawler Tractors in the World*

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## CARS, INDUSTRIAL V. DUMPING

\*Weller Mfg. Co., Chicago, Ill.  
Atlas Car & Mfg. Co., Cleveland, O.  
Austin Machinery Corp'n, Chicago, Ill.  
Chase Fdry. & Mfg. Co., Cleveland, Ohio.  
Easton Car & Const'n Co., New York.  
Insley Mfg. Co., Indianapolis, Ind.  
Kilbourne & Jacobs Mfg. Co., Columbus, O.  
Koppel Ind. Car & Equip. Co., Koppel, Pa.  
Lakewood Engineering Co., Cleveland, O.  
Light Ry. Equipment Co., Philadelphia, Pa.  
Oliver Mfg. Co., W. J., Knoxville, Tenn.  
Stuebner Iron Works, G. L., Long Island City, N. Y.  
United Iron Works, Kansas City, Mo.  
Whiting Corp'n, Harvey, Ill.

## CARTS, CONCRETE

\*Littleford Bros., Cincinnati, O.  
\*Smith Co., T. L., Milwaukee, Wis.  
Akron Barrow Co., Columbus, O.  
Etnyre & Co., E. D., Oregon, Ill.  
Gray Iron Fdry. Co., Reading, Pa.  
Insley Mfg. Co., Indianapolis, Ind.  
Kilbourne & Jacobs Mfg. Co., Columbus, O.  
Lakewood Engineering Co., Cleveland, O.  
Lee Trailer & Body Co., Chicago, Ill.  
Ransome Concrete Machy. Co., Danellen, N. J.  
Standard Scale & Supply Co., Pittsburgh, Pa.  
Sterling Wheelbarrow Co., Milwaukee, Wis.  
Toledo Wheelbarrow Co., Toledo, Ohio.

## CAST IRON PIPE (See Pipe, Cast Iron)

## CASTINGS, STREET AND SEWER

\*Central Foundry Co., New York.  
\*Clark Co., H. W., Mattoon, Ill.  
\*U. S. Cast Iron Pipe & Fdry. Co., Burlington, N. J.

Canton Foundry & Machine Co., Canton, O.  
Casey-Hedges Co., Chattanooga, Tenn.  
Clow & Sons, J. B., Chicago, Ill.  
Dee Co., W. E., Chicago, Ill.  
Dobbie Foundry & Mach. Co., Niagara Falls, N. Y.  
Foundry Mfg. Co., St. Albans, Vt.  
Klauer Mfg. Co., Dubuque, Iowa.  
Madison Foundry Co., Cleveland, O.  
Pechstein Iron Works, Keokuk, Ia.  
Reading Steel Casting Co., Bridgeport, Conn.  
Sessions Foundry Co., Bristol, Conn.  
South Bend Foundry Co., South Bend, Ind.

## CATCH BASINS (See Castings, Street and Sewer)

## CATCH BASIN CLEANING APPARATUS

Elgin Sales Corp., New York.  
International Motor Co., New York.

## CAULKING MACHINERY AND TOOLS

Helwig Mfg. Co., St. Paul, Minn.  
Ingersoll-Rand Co., N. Y. C.  
Mueller Mfg. Co., H., Decatur, Ill.

## CEILINGS, METAL

Berger Mfg. Co., Canton, O.  
Canton Art Metal Co., Canton, O.  
Newport Rolling Mill Co., Newport, Ky.  
Klauer Mfg. Co., Dubuque, Iowa.  
Mesker & Co., Geo. L., Evansville, Ind.  
Milwaukee Corrugating Co., Milwaukee, Wis.  
Wheeling Corrugating Co., Wheeling, W. Va.

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\*Pennsylvania Cement Co., New York  
Etna Portland Cement Co., Detroit, Mich.  
Allentown Portland Cement Co., Allentown, Pa.  
Alpha Portland Cement Co., Easton, Pa.  
Ash Grove Lime and Portland Cement Co., Kansas City, Mo.  
Atlas Portland Cement Co., New York.  
Bath Portland Cement Co., Philadelphia, Pa.  
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\* Indicates that the manufacturer carries on advertisement. See index facing inside back cover.





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The Tractor that Serves 365 Days a Year

You can keep your streets and roads free from snow in winter and without ruts in summer by motorizing your snow removal and road maintenance equipment with a Monarch Industrial Tractor. These tractors, equipped with snow plows quickly open up your streets after the heaviest snow storm and pulling blade or elevating graders can maintain your roads or build new roads with the greatest economy. Write for our interesting booklet "Monarch Facts" describing the work of the Monarch tractor, an efficient all-season machine.

**MONARCH TRACTORS INCORPORATED**  
WATERTOWN WISCONSIN



*And in the Summer—*

Power, simplicity and accessibility are qualities built into Monarch Industrial Tractors, which insure their continuous and consistent operation under the blazing sun of summer as well as in the extreme cold of winter.

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 Cape Girardeau Portland Cement Co., Cape Girardeau, Mo.  
 Castalia Portland Cement Co., Pittsburgh, Pa.  
 Clinefield Portland Cement Corp., Kingsport, Tenn.  
 Colorado Portland Cement Co., Denver, Colo.  
 Continental Portland Cement Co., St. Louis, Mo.  
 Coplay Cement Manufacturing Co., Coplay, Pa.  
 Cowell Portland Cement Co., San Francisco, Cal.  
 Crescent Portland Cement Co., Wampum, Pa.  
 Dewey Portland Cement Co., Kansas City, Mo.  
 Dexter Portland Cement Co., Nazareth, Pa.  
 Diamond Portland Cement Co., Cleveland, Ohio.  
 Dixie Portland Cement Co., Chattanooga, Tenn.  
 Edison Portland Cement Co., New York.  
 Fredonia Portland Cement Co., Fredonia, Kans.  
 Giant Portland Cement Co., Philadelphia, Pa.  
 Gilmore Portland Cement Corp., Gilmore City, Iowa.  
 Glens Falls Portland Cement Co., Glens Falls, N. Y.  
 Golden State Portland Cement Co., Los Angeles, Cal.  
 Gulf States Portland Cement Co., Demopolis, Ala.  
 Hawkeye Portland Cement Co., Des Moines, Ia.  
 Helderberg Cement Co., Albany, N. Y.  
 Hercules Cement Corp., Philadelphia, Pa.  
 Indiana Portland Cement Co., Indianapolis, Ind.  
 International Portland Cement Co., Ltd., Spokane, Wash.  
 Knickerbocker Portland Cement Co., Inc., New York.  
 Kosmos Portland Cement Co., Louisville, Ky.  
 Lawrence Portland Cement Co., Northampton, Pa.  
 Lehigh Portland Cement Co., Allentown, Pa.  
 Louisville Cement Co., Louisville, Ky.  
 Marquette Cement Mfg. Co., Chicago, Ill.  
 Missouri Portland Cement Co., St. Louis, Mo.  
 Monarch Cement Co., Humboldt, Kans.  
 Nazareth Cement Co., Nazareth, Pa.  
 Newaygo Portland Cement Co., Newaygo, Mich.  
 Nebraska Portland Cement Co., Denver, Colo.  
 New Egyptian Portland Cement Co., Fenton, New York.  
 New York Portland Cement & Lime Co., New York.  
 Northwestern States Portland Cement Co., Mason City, Ia.  
 Ogden Portland Cement Co., Ogden, Utah.  
 Oklahoma Portland Cement Co., Denver, Colo.  
 Old Mission Portland Cement Co., San Francisco, Cal.  
 Olympic Portland Cement Co., Ltd., Seattle, Wash.  
 Oregon Portland Cement Co., Portland, Ore.  
 Pacific Portland Cement Co., San Francisco, Cal.  
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 Peninsular Portland Cement Co., Cement City, Mich.  
 Penn-Allen Cement Co., Allentown, Pa.  
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 Southern States Portland Cement Co., Rockport, Ga.  
 Southwest Portland Cement Co., El Paso, Tex.  
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 Trinity Portland Cement Co., Dallas, Tex.  
 Union Portland Cement Co., Ogden, Utah.  
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 Universal Portland Cement Co., Chicago, Ill.  
 Vulcanite Portland Cement Co., Philadelphia, Pa.

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 Wellston Iron Furnace Co., Jackson, Ohio.  
 Western States Portland Cement Co., Independence, Kans.  
 Whitehall Cement Mfg. Co., Philadelphia, Pa.  
 Wolverine Portland Cement Co., Coldwater, Mich.  
 Wyandotte Portland Cement Co., Detroit, Mich.

## CEMENT INSPECTION (See Inspecting Laboratories)

### CHAINS

\*Weller Mfg. Co., Chicago, Ill.  
 American Chain Co., Inc., Bridgeport, Conn.  
 Chain Belt Co., Milwaukee, Wis.  
 Columbus McKinnon Chain Co., Columbus, O.  
 Jeffrey Mfg. Co., Columbus, O.  
 Link-Belt Co., Chicago, Ill.  
 Niagara Metal Stamp Corp., Niagara Falls, N. Y.  
 U. S. Chain & Forge Co., Pittsburgh, Pa.  
 Webster Mfg. Co., Chicago, Ill.

### CHECK VALVES

\*Ludlow Valve Mfg. Co., Troy, N. Y.  
 Columbian Iron Works, Chattanooga, Tenn.  
 Lunkenheimer Co., Cincinnati, O.  
 Mueller Mfg. Co., H. Decatur, Ill.

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Du Pont de Nemours & Co., E. I., Wilmington, Del.  
 Electro Bleaching Gas Co., New York.  
 General Chemical Co., New York.  
 Mathieson Alkali Works, Inc., N. Y. O.  
 Penna. Salt Mfg. Co., Philadelphia, Pa.

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Heine Chimney Co., Chicago, Ill.  
 Rust Engineering Co., Pittsburgh, Pa.  
 Weber Chimney Co., Chicago, Ill.

### CHIMNEYS, RADIAL BRICK

American Chimney Corp., New York  
 Custodia Chimney Const. Co., Alphons, New York.  
 Heine Chimney Co., Chicago, Ill.  
 Kellogg & Co., M. W., New York.  
 Rust Engineering Co., Pittsburgh, Pa.

### CHIMNEYS, STEEL (See Stacks, Steel)

### CHLORINATORS

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### CHLORINE, LIQUID (See Liquid Chlorine)

### CHUTES, CONCRETE

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 Lakewood Engineering Co., Cleveland, O.  
 Ransome Concrete Machy. Co., Dunellen, N. J.

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 American Steel & Wire Co., Chicago, Ill.  
 Broderick & Bascom Rope Co., St. Louis, Mo.  
 Carpenter Co., Geo. B., Chicago, Ill.  
 Leschen & Sons Rope Co., A., St. Louis, Mo.  
 Marion Malleable Iron Works, Marion, Ind.  
 Mockbee & Co., C. M., Cincinnati, O.  
 Roebling Sons Co., J. A., Trenton, N. J.  
 Upson-Walton Co., Cleveland, O.

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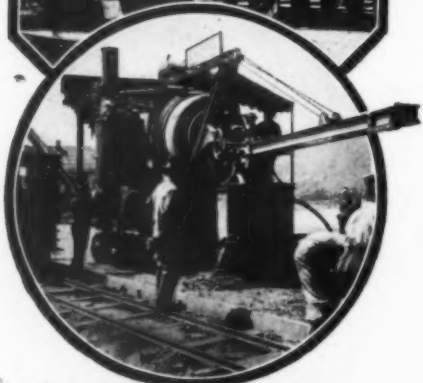
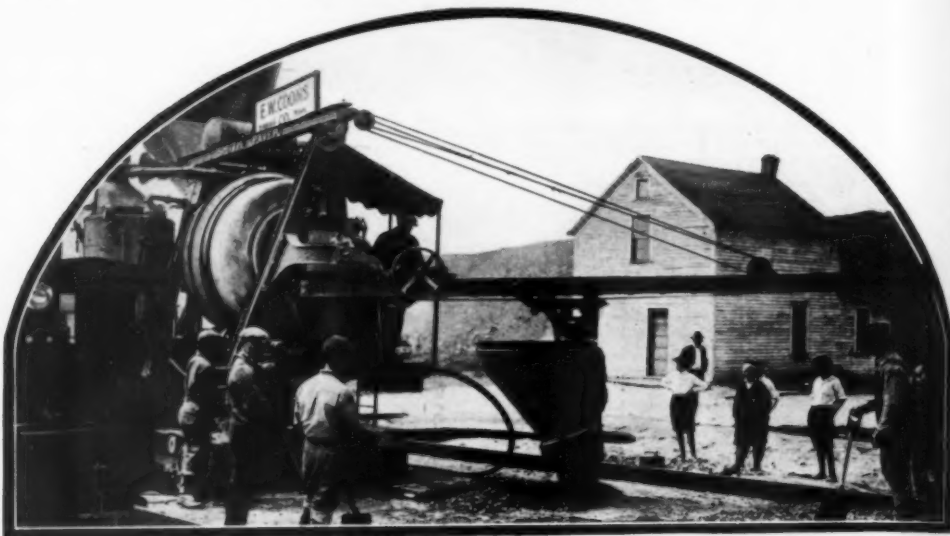
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 \*Hais Mfg. Co., Geo., New York.  
 \*Portable Machinery Co., Passaic, N. J.  
 \*Weller Mfg. Co., Chicago, Ill.  
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 Bartlett & Snow Co., O. O., Cleveland, Ohio.  
 Blaw-Knox Co., Pittsburgh, Pa.  
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 Byers Machine Co., Ravenna, Ohio.  
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 Fairfield Engineering Co., Lancaster, Ohio.  
 Gifford-Wood Co., Hudson, N. Y.  
 Hayward Co., New York.  
 Hunt Co., Inc., C. W., West New Brighton, N. Y.  
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 Kon-Wald Co., Buffalo, N. Y.  
 Lidgerwood Mfg. Co., New York.  
 Link-Belt Co., Chicago, Ill.  
 Mead-Morrison Mfg. Co., E. Boston, Mass.  
 Robins Conveying Belt Co., New York.  
 Webster Mfg. Co., Chicago, Ill.

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 Chapman Valve Mfg. Co., Indian Orchard, Mass.

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Three views of E. W. Coon's Machine making record on Minnesota road work.

## Power - Speed - Economy

ON the state highways of Minnesota they like the power, ruggedness, and "get-there" performance of Smith Pavers. Records never before attained have been made.

The design and construction of Smith 1922 Pavers make it possible for them to stand the gaff of strenuous high production operation.

The two 21-E Pavers owned by E. W. Coons Co., of Hibbing, have exceeded this company's most optimistic expectations. On the Duluth to Eveleth job, Aaby & Maturi have been exceeding each previous week's record since they started in May. In less than two months' time 6.1 miles of 18-foot wide highway have been completed.

### Big Skip and Power Derrick

Two wheelbarrows or a truck can unload into the big Smith Skip which discharges quickly into the large opening of the drum.

The power-operated Derrick is one of the most popular features of Smith Pavers where aggregate is supplied in batch boxes. It is used on either side and requires no extra road wheels. Where best production records have been made, this Smith Derrick has been found invaluable.

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11

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 Hydraulic Steelcraft Co., Cleveland, O.  
 Insley Mfg. Co., Indianapolis, Ind.  
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 \*Smith Co., T. L., Milwaukee, Wis.  
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 Badger Concrete Mixer Co., Milwaukee, Wis.  
 Chain Belt Co., Milwaukee, Wis.  
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 Gray Iron Fdry Co., Reading, Pa.  
 Jaeger Machine Co., Columbus, O.  
 Judy Mfg. Co., Centerville, Ia.  
 Knickerbocker Co., Jackson, Mich.  
 Lakewood Engineering Co., Cleveland, O.  
 Lansing Co., Lansing, Mich.  
 Marsh-Capron Co., Chicago, Ill.  
 Oakkosh Mfg. Co., Oakkosh, Wis.  
 Ransome Concrete Machy. Co., Danellen, N. J.  
 Republic Iron Works, Tecumseh, Mich.  
 Schramm & Son, Inc., Chris. D., West Chester, Pa.  
 Standard Scale & Supply Co., Pittsburgh, Pa.  
 Truckmixer Co., Milwaukee, Wis.  
 Worthington Pump & Mach'y Corp., New York.

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 Concrete Steel Co., New York.  
 Consolidated Expanded Metal Co., Braddock, Pa.  
 Corrugated Bar Co., Inc., Buffalo, N. Y.  
 Electric Welding Co., Pittsburgh, Pa.  
 General Fireproofing Co., Youngstown, O.  
 Inland Steel Co., Chicago, Ill.  
 Lackawanna Steel Co., Buffalo, N. Y.  
 National Steel Fabric Co., Pittsburgh, Pa.  
 Ryerson & Son, J. T., Chicago, Ill.  
 Wickwire Spencer Steel Corp., Worcester, Mass.  
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 Youngstown Sheet & Tube Co., Youngstown, O.

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 Dieck Clay Mfg. Co., W. S., Kansas City, Mo.  
 Fibre Conduit Co., Orangeburg, N. Y.  
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**CONTRACTORS SUPPLY DEALERS**  
 See pages 76 - 90.

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 \*Gray Steel Prod. Co., New York.

\*Haetten Co., J. E., New York.  
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 Hanna Eng. Works, Chicago, Ill.  
 Industrial Works, Bay City, Mich.  
 Link-Belt Co., Chicago, Ill.  
 Locomotive Crane Co. of America, Champaign, Ill.  
 Marion Steam Shovel Co., Marion, O.  
 McMyer Interstate Co., Cleveland, O.  
 Northwest Engineering Works, Chicago, Ill.  
 Orton & Steinbrenner Co., Chicago, Ill.  
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 Osgood Co., The, Marion, O.  
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 Champion Engineering Co., Kenton, O.  
 Milwaukee Electric Crane Co., Milwaukee, Wis.  
 Morgan Engineering Co., Alliance, O.  
 Northern Eng. Works, Detroit, Mich.  
 Pawling & Harnischfeger Co., Milwaukee, Wis.  
 Shaw Crane Works, Muskegon, Mich.  
 Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.  
 Toledo Crane Co., Bucyrus, O.  
 Whiting Fdry. & Equip. Co., Harvey, Ill.

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*Never Turns Around  
Never Backs Down*



## The Doughboy Jack

—the lightest jack made for its capacity. Weighs considerably less than other jacks of equal power, in some sizes less than half as much.

Sizes for 15 to 100 tons

Easy to operate; a 24-inch handle provides ample leverage. Has a positive check to prevent damage from over-extension. Made of steel throughout.

*Bulletin 29 tells all about  
the Doughboy Jack.*

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Rock Drills—Pile Hammers—Lifting Jacks—Mining and Quarrying Machinery

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Works at Dover, N. J.

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*Built for Hard Work*



### SHOWING WORK ON DIXIE HIGHWAY

Operates without outriggers.  
One machine — Many uses.

A convertible loader, digger, or derrick operates following attachments:

3/4-yd. Clamshell  
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Skimmer Scoop  
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Electric Magnet

Gasoline engine or electric motor, crawler trucks or tractor wheels. All steel boom.

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### THE ONE MAN EXCAVATOR

A light, low priced, economical digger for clay, sand and gravel pits, Road Contractors, small trenches, or light excavation of any sort.

### Bay City Dredge Works

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Southern Cresoting Co., Ltd., Slidell, La.  
Southern Paving Const. Co., Chattanooga, Tenn.  
Wyckoff Pipe & Cresoting Co., New York.

## CRUSHERS AND PULVERIZERS (See Rock Crushers)

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Canton Culvert & Silo Co., Canton, O.  
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Concrete Form Co., Inc., Syracuse, N. Y.  
Dee Co., W. E., Chicago, Ill.  
Dominion Metal Products Corp., Roanoke, Va.  
Florida Metal Products Co., Jacksonville, Fla.  
Galien Iron Works & Mfg. Co., Galien, O.  
Hardesty Mfg. Co., The R., Denver, Colo.  
Klauser Mfg. Co., Dubuque, Ia.  
Lyle Culv. & Rd. Equip. Co., Minneapolis, Minn.  
Madison Foundry Co., Cleveland, O.  
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Thompson-Flemming Co., Inc., Buffalo, N. Y.

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National Steel Fabric Co., Pittsburgh, Pa.  
Steel Protected Concrete Co., Philadelphia, Pa.

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Armstrong Mfg. Co., Bridgeport, Conn.  
Barnes Tool Co., New Haven, Conn.  
Erie Tool Works, Erie, Pa.  
Greenfield Tap & Die Corp., Greenfield, Mass.  
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Milburn Co., Alexander, Baltimore, Md.  
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Flory Mfg. Co., S., Bangor, Pa.  
Insley Mfg. Co., Indianapolis, Ind.  
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Lidgerwood Manufacturing Co., New York.  
Lincoln Iron Works, Rutland, Vt.  
National Hoisting Engine Co., Harrison, N. J.  
Sagson Derrick Co., Chicago, Ill.  
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Superior Iron Works, Superior, Wis.

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Hayward Co., New York.  
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\*Terry Mfg. Co., New York.  
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Penn Metal Co., Boston, Mass.  
Riester & Theismacher Co., Cleveland, Ohio.  
Sykes Co., Chicago, Ill.  
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Ellieott Machine Corp'n., Baltimore, Md.  
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Hayward Co., New York.  
Lidgerwood Mfg. Co., New York.  
Marion Steam Shovel Co., Marion, O.  
Osgood Co., The, Marion, O.  
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Superior Iron Works, Superior, Wis.  
Vulcan Iron Works, Jersey City, N. J.

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Bucyrus Co., South Milwaukee, Wis.  
Fairbanks Steam Shovel Co., Marion, O.  
Marion Steam Shovel Co., Marion, O.  
Osgood Co., Marion, O.

\* Indicates that the manufacturer carries an advertisement. See index facing inside back cover.

# FLORIDA

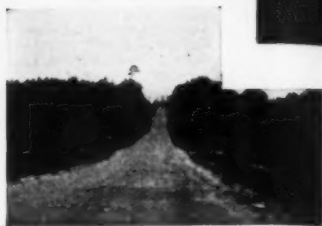


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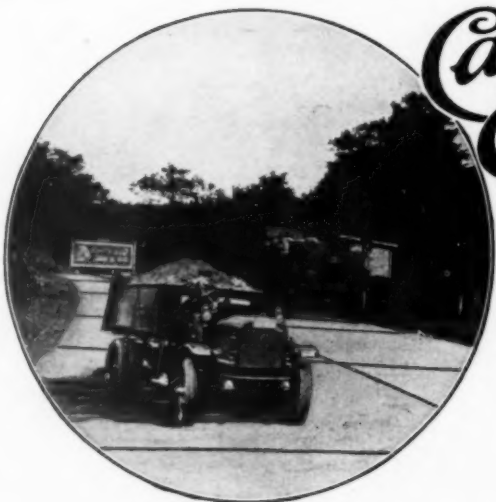
\*Austin Western Road Mach'y Co., Chicago, Ill.  
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Robins Conv. Belt Co., N. Y. O.  
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**PROVED AND  
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*The traffic impact  
shatters the un-  
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7-22



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Erie Steam Shovel Co., Erie, Pa.  
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Hayward Co., New York.  
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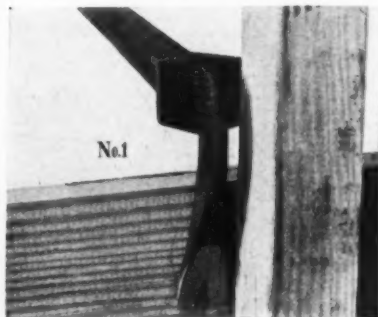
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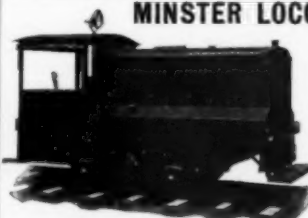


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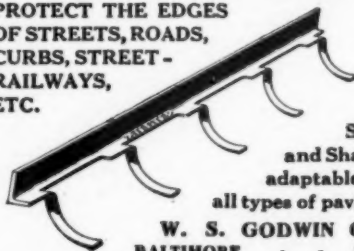
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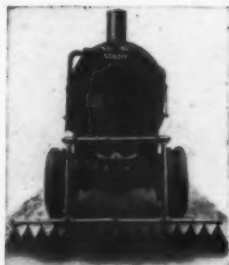
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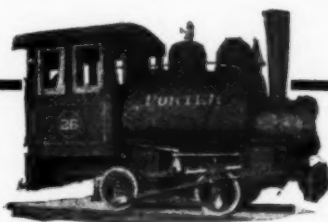
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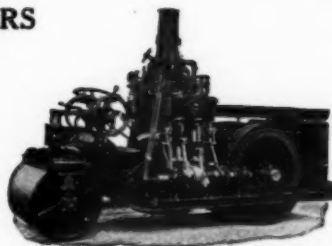
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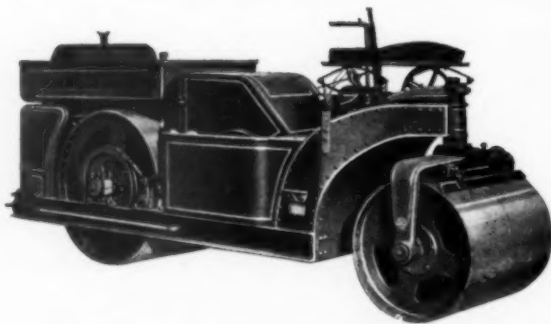
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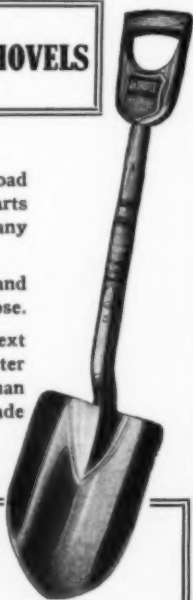
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 \*Pittsburgh Shovel Co., Pittsburgh, Pa.  
 American Shovel & Stamping Co., Lorain, O.  
 Ames Shovel & Tool Co., Boston, Mass.  
 Beall Bros. Co., Alton, Ill.  
 Chisholm Shovel Co., Cleveland, O.  
 Conneaut Shovel Co., Conneaut, O.  
 Hubbard & Co., Pittsburgh, Pa.  
 Indiana Shovel Co., New Castle, Ind.  
 Jackson Shovel Co., Montpelier, Ind.  
 Russell Shovel Co., Allquippa, Pa.  
 Stevens-Webb Co., Inc., Altoona, Pa.  
 Union Furnace Mfg. Co., Altoona, Pa.  
 Wood Shovel & Tool Co., Eiqua, Ohio.  
 Wyoming Shovel Works, Wyoming, Pa.

**SHOVELS, STEAM**  
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 \*Smith Co., T. L., Milwaukee, Wis.  
 \*Thew Shovel Co., Lorain, O.  
 American Steel Dredge Co., Fort Wayne, Ind.  
 Austin Machinery Corp'n, Chicago, Ill.  
 Ball Engine Co., Erie, Pa.  
 Bellwood Steam Shovel Co., Bellwood, Pa.  
 Browning Co., Cleveland, O.  
 Bucyrus Co., South Milwaukee, Wis.  
 Byers Machine Co., J. F., Ravenna, Ohio.  
 Erie Steam Shovel Co., Erie, Pa.  
 Fairbanks Steam Shovel Co., Marion, O.  
 Industrial Works, Bay City, Mich.  
 Marion Steam Shovel Co., Marion, O.  
 Osgood Co., Marion, O.

**SIGNS, STREET AND ROAD**  
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 Ingram-Richardson Mfg. Co., Beaver Falls, Pa.  
 Lyle-Signs, Minneapolis, Minn.  
 N. Y. Enamelled Steel Sign Co., New York.  
 Safety Equipment Service Co., Cleveland, O.  
 Thompson-Fleming Co., Inc., Buffalo, N. Y.  
 Union Iron Products Co., East Chicago, Ind.  
 Western Display & Mfg. Co., St. Paul, Minn.

**SIGNS, TRAFFIC**  
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 Esco Mfg. Co., Peoria, Ill.  
 Federal Signal Co., Albany, N. Y.  
 Ingram-Richardson Mfg. Co., Beaver Falls, Pa.  
 Little Giant Co., Mankato, Minn.  
 Lyle-Signs, Minneapolis, Minn.  
 Mound Traffic Equip. Co., Columbus, O.  
 Thompson-Fleming, Inc., Buffalo, N. Y.  
 Union Iron Products Co., E. Chicago, Ind.

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 Vendor Slate Co., Inc., Easton, Pa.

**SLATE, STRUCTURAL**  
 Penna. Structural Slate Co., Easton, Pa.  
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 Rensselaer Valve Co., Troy, N. Y.  
 Smith Mfg. Co., A. P., East Orange, N. J.

**SLUICE GATES. (See Gates, Sluice.)**

**SMOKE STACKS. (See Stacks, Steel)**

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 \*Baker Mfg. Co., Springfield, Ill.  
 \*Cleveland Tractor Co., Cleveland, O.  
 \*Good Roads Mach. Co., Kennett Square, Pa.  
 \*Holt Mfg. Co., Peoria, Ill.  
 \*Monarch Tractors, Inc., Watertown, Wis.  
 Avery Co., Peoria, Ill.  
 Barber-Greene Co., Aurora, Ill.  
 International Motor Co., New York.  
 Toy Co., W. M., Sidney, Ohio.  
 J. T. Tractor Co., Cleveland, O.  
 Owensboro Ditcher & Grader Co., Owensboro, Ky.

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 Deming Co., The, Salem, Ohio.  
 Field Force Pump Co., Elmira, N. Y.  
 Fitzhenry-Guptill Co., Boston, Mass.

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 \*Burch Flow Works Co., Crestline, O.

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For Heating and Applying under Pressure all varieties of Bituminous Materials, Hot or Cold, for Road Construction, Maintenance or Dust Laying.

Heat and volume under instant control of operator. Positive pressure produced by the Kinney Pump.

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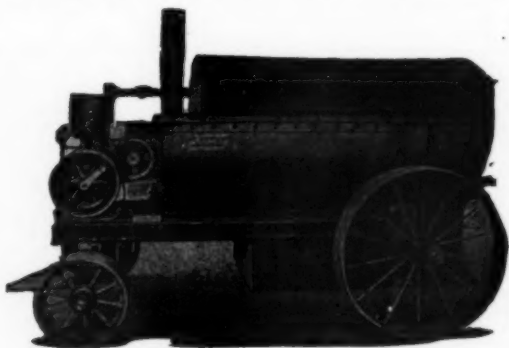


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Especially adapted for Road maintenance, construction and general repair work. Contents constantly agitated while heating.

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No Steam Required.



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3529 Washington Street  
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- \*Heil Co., The, Milwaukee, Wis.
- \*Littleford Bros., Cincinnati, O.
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- Chatta. Boiler & Tank Co., Chattanooga, Tenn.
- Chicago Bridge & Iron Works, Chicago, Ill.
- Honhorst Co., Jos., Cincinnati, O.
- Petroleum Iron Works Co., Sharon, Pa.
- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
- Walsh & Weldner Boiler Co., Chattanooga, Tenn.

## STEAM SHOVELS. (See Shovels, Steam)

## STANDPIPES, TANKS AND TOWERS

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- Chattanooga B'r. & Tank Co., Chattanooga, Tenn.
- Chicago Bridge & Iron Works, Chicago, Ill.
- Lancaster Iron Wks., Lancaster, Pa.
- Pacific Tank & Pipe Co., San Francisco, Cal.
- Petroleum Iron Works Co., Sharon, Pa.
- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- United Iron Works, Kansas City, Mo.
- Walsh & Weldner Boiler Co., Chattanooga, Tenn.

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- Ingersoll-Rand Co., New York.
- Westinghouse Elec. & Mfg. Co., E. Pittsb'gh, Pa.

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- Blaw-Knox Co., Pittsburgh, Pa.
- Chatta. Boiler & Tank Co., Chattanooga, Tenn.
- Chicago Bridge & Iron Works, Chicago, Ill.
- Helmsted Steel Form & Iron Co., Warren, O.
- Hendrick Mfg. Co., Carbondale, Pa.
- Honhorst Co., Jos., Cincinnati, Ohio.
- McClintic-Marshall Co., Pittsburgh, Pa.
- Pennsylvania Bridge Co., Beaver Falls, Pa.
- Petroleum Iron Works Co., Sharon, Pa.
- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- Ritter-Conley Co., Pittsburgh, Pa.
- Scaife & Sons, Wm. B., Pittsburgh, Pa.
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- Vulcan Iron Works, Jersey City, N. J.
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- Sanford Riley Stoker Co., Worcester, Mass.
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- \*General Motors Truck Co., Pontiac, Mich.
- \*Municipal Supply Co., South Bend, Ind.
- Etnyre & Co., E. D., Oregon, Ill.
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- Four Wheel Drive Auto Co., Clintonville, Wis.
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- White Co., Cleveland, O.

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- Electric Railway Equipment Co., Cincinnati, O.
- General Electric Co., Schenectady, N. Y.
- King Mfg. Co., Chicago, Ill.
- Massey Concrete Products Co., Chicago, Ill.
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## STREET SIGNS (See Signs, Street)

## STREET SWEEPERS

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- Elgin Sales Corp'n, New York.

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- Light Ry. Equip. Co., Philadelphia, Pa.

## TABLES AND BOARDS, DRAWING. (See Drawing Materials.)

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- Ingersoll-Rand Co., New York
- Pawling & Harnischfeger Co., Milwaukee, Wis.

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- \*Littleford Bros., Cincinnati, O.
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- Biggs Boiler Wks., Akron, O.
- Indiana Air Pump Co., Indianapolis, Ind.
- Chicago Bridge & Iron Works, Chicago, Ill.
- Ingersoll-Rand Co., New York.
- Lancaster Iron Wks., Lancaster, Pa.
- National Tube Co., Pittsburgh, Pa.
- Petroleum Iron Works Co., Sharon, Pa.
- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- Scaife & Sons Co., W. B., Pittsburgh, Pa.
- Westinghouse Tract. Erake Co., Wilmerding, Pa.
- Worthington Pump & Mach'y. Corp., New York.

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- Chicago Bridge & Iron Works, Chicago, Ill.
- Dover Boiler Works, New York.
- Ponts Co., C. C., Middletown, O.
- Honhorst Co., Jos., Cincinnati, Ohio.
- Pacific Tank & Pipe Co., San Francisco, Cal.
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- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
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- Wayne Tank & Pump Co., Ft. Wayne, Ind.

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- Milwaukee Corrugating Co., Milwaukee, Wis.
- Petroleum Iron Works Co., Sharon, Pa.
- Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa.
- Scaife & Sons, Wm. B., Oakmont, Pa.

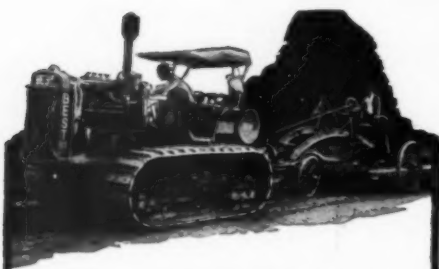
## TANKS, WOOD

- Caldwell Co., W. E., Louisville, Ky.
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- Eagle Tank Co., Chicago, Ill.
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The improved design and substantial construction of Heil Bodies will increase the earning power of your trucks. These 2 "Batch" 2 yard Bodies and Hydro Hoists are always on the job.

"Bodies for Road Builders," sent free.

Write for your copy.

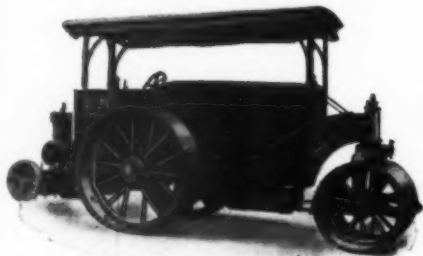
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1 yard Gravity Dump Body. Price \$100.00 each.  
Special quantity price to contractors.



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10 Gallon Capacity

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This kettle (10-gallon capacity) is ideal for road contractors and is especially made for small patch work where there are a considerable number of small holes to be properly filled up with gravel or crushed stone and cemented with bituminous binder. The inside pot lifts out and can readily be used as a pouring pot.

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4000 N. SECOND STREET, PHILADELPHIA, PA.

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Case Threshing Machine Co., J. I., Racine, Wis.  
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Watson Products Corp'n., Canastota, N. Y.
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Eddy Valve Co., Watertown, N. Y.  
Fairbanks Co., The, New York.  
Iowa Valve Co., Oskaloosa, Ia.  
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Fairbanks Co., The, New York.  
Iowa Valve Co., Oskaloosa, Ia.  
Kennedy Valve Mfg. Co., Elmira, N. Y.  
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Pratt & Cady Co., Inc., Hartford, Conn.  
Rensselaer Valve Co., Troy, N. Y.  
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- WAGON BODIES.** (See Dump Bodies)
- WAGON LOADERS.** (See Loaders, Gravel and Wagon)
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Consolidated Expanded Metal Co., Braddock, Pa.  
Berger Mfg. Co., Canton, O.

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- Milwaukee Corrugating Co., Milwaukee, Wis.  
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- WATER MAIN CLEANING**  
 \*National Water Main Cleaning Co., New York.
- WATER MAIN TAPPING MACHINES**  
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 Atlantic Refining & Asphalt Corp., Phil'a, Pa.  
 Barrett Company, New York.  
 General Fireproofing Co., Youngstown, O.  
 Granitex Corp., New York.  
 Horn Co., A. C., Long Island City, N. Y.  
 Master Builders' Co., Cleveland, O.  
 Minwax Co., The, New York.  
 Protexol Corp., New York.  
 Ruberoid Co., New York.  
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 Truscon Laboratories, Detroit, Mich.
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 Clow & Sons, J. B., Chicago, Ill.  
 Electro Bleaching Gas Co., New York.  
 N. Y. Continental Jewell Filter Co., Nutley, N.J.  
 Mathieson Alkali Works, Inc., New York.  
 Norwood Eng. Co., Florence, Mass.  
 Penna. Salt Mfg. Co., Philadelphia, Pa.  
 Permutit Co., New York.  
 Pittsburgh Filter & Eng. Co., Pittsburgh, Pa.  
 R. U. V. Company, New York.  
 Roberts Filter Co., Darby, Pa.  
 Scaife & Sons Co., Wm. B., Pittsburgh, Pa.
- WATER REGULATORS**  
 \*Union Water Meter Co., Worcester, Mass.  
 Mueller Mfg. Co., Decatur, Ill.  
 Pacific Flush Tank Co., Chicago, Ill.
- WATER SOFTENERS**  
 American Water Softener Co., Philadelphia, Pa.  
 Borromite Co., Chicago, Ill.  
 International Filter Co., Chicago, Ill.  
 N. Y. Continental Jewell Filter Co., Nutley, N. J.  
 Permutit Company, New York.  
 Pittsburgh Filter & Eng. Co., Pittsburgh, Pa.  
 Refinite Co., Omaha, Neb.  
 Roberts Filter Mfg. Co., Darby, Pa.  
 Scaife & Sons, W. B., Pittsburgh, Pa.
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 Leffel & Co., Jas., Springfield, O.  
 Pelton Water Wheel Co., San Francisco, Cal.  
 Smith Company, S. Morgan, York, Pa.
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 Milburn Company, Alex., Baltimore, Md.  
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 American Well Works, Aurora, Ill.  
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 Leidecker Tool Co., Marietta, Ohio.
- Loomis Machine Co., Tiffin, O.  
 Sanderson Cyclone Drill Co., Orrville, Ohio.  
 Sparta Iron Wks. Co., Sparta, Wis.  
 Star Drilling Machine Co., Akron, O.
- WHEELBARROWS**  
 Akron Barrow Co., Cleveland, O.  
 Jackson Mfg. Co., Harrisburg, Pa.  
 Kilbourne & Jacobs Mfg. Co., Columbus, O.  
 Lansing Co., Lansing, Mich.  
 Sidney Steel Scraper Co., Sidney, O.  
 Sterling Wheelbarrow Co., Milwaukee, Wis.  
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 Toledo Wheelbarrow Co., Toledo, O.
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 Mead-Morrison Mfg. Co., E. Boston, Mass.  
 Mundy Hoisting Eng. Co., J. S., Newark, N. J.
- WINDOW FRAMES AND SASH.** (Metallic.)  
 \*Truscon Steel Co., Youngstown, O.  
 Bayley Co., Wm., Springfield, O.  
 Detroit Steel Products Co., Detroit, Mich.  
 Friedrich Co., E. H., Holyoke, Mass.  
 Lupton's Sons Co., David, Philadelphia, Pa.  
 McFarland Co., J. C., La Porte, Ind.  
 Penn Metal Co., Boston, Mass.  
 Sykes Co., Chicago, Ill.
- WIRE AND CABLE**  
 American Steel & Wire Co., Chicago, Ill.  
 General Electric Co., Schenectady, N. Y.  
 Habirshaw Elec. Cable Co., Inc., N. Y. C.  
 Hazard Mfg. Co., Wilkesbarre, Pa.  
 Macwhyrte Co., Kenosha, Wis.  
 National India Rubber Co., Bristol, R. I.  
 New York Insulated Wire Co., New York.  
 Okonite Co., Passaic, N. J.  
 Roebbling's Sons Co., J. A., Trenton, N. J.  
 Safety Ins. Wire & Cable Co., New York.  
 Simplex Wire & Cable Co., Boston, Mass.  
 Standard Underground Cable Co., Pittsburgh, Pa.  
 Tubular Woven Fabric Co., Pawtucket, R. I.  
 Waterbury Co., New York.
- WIRE GLASS**  
 Mississippi Wire Glass Co., New York.
- WIRE MESH REINFORCEMENT**  
 \*Truscon Steel Co., Youngstown, O.  
 American Steel & Wire Co., Chicago, Ill.  
 National Steel Fabric Co., Pittsburgh, Pa.  
 Wickwire Spencer Steel Corp., Worcester, Mass.
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- WOOD BLOCKS** (See Paving Blocks)
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 Ransome Concrete Mach. Co., Dunellen, N. J.
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 Barrett Company, New York.  
 General Chemical Co., New York.  
 Protexol Corp., New York.  
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 \*Anderson Bros. Mfg. Co., Rockford, Ill.
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# CONTRACTORS' & ENGINEERS' MONTHLY

A PURCHASING GUIDE FOR ENGINEERS, CONTRACTORS, PUBLIC OFFICIALS AND OTHER PURCHASERS  
OF CONSTRUCTION MATERIALS AND EQUIPMENT

Published Monthly at 154 Nassau St., New York, by The Civic Press, Inc.  
25 Cents a Copy. \$1.00 a Year. Printed in U. S. A.

Branch Chicago, Ill., 327 So. LaSalle Street. Tom Dix, Vice-President  
Office San Francisco, 320 Market Street. W. A. Douglass, Pacific Coast Representative

Vol. V

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# Contractors' & Engineers' Monthly

Vol. V, No. 3

New York

September, 1922

## Accounting for Man's Economic Use of Time —A Means of Reducing Waste

ROBERT B. WOLF, a member of the Federated American Engineering Societies Waste Committee, declares that the accountant to-day holds the key to the price situation, as there can be no continual downward trend in prices until workers know production costs. The accountant can either release great creative power for constructive purposes or produce repressive conditions which, by keeping men in ignorance, will not only make for indifference, but will actually produce a desire to destroy the existing order. World-old principles of human nature can be applied to modern construction so that the net result will produce even a greater joy of accomplishment than was offered in the old days of individual craftsmanship.

To return to the old days is impossible and is not believed to be at all desirable, according to Mr. Wolf. The era of new craftsmanship into which we are just emerging does not demand manual dexterity, but intelligent conformation to natural law.

In manufacturing and contracting, three kinds of records are used—quality, quantity and economy, and while scientific direction of processes has made quality and quantity records available to an ever-increasing number of men, very little intelligent use of cost or economy records has been made to stimulate the workers to lower production costs. It seems unreasonable to expect a workman or a foreman to

take an interest in future economies if he has no means of measuring the economy with which he has performed in the past. A game would be extremely uninteresting without a score, and operations of manufacturing or construction would become quite monotonous, even to the manager, if he had no cost sheets with which to measure the daily progress of his work.

When we keep intelligible records of the cost of production and then see that these records get into the hands of the workers that are responsible for the work, this knowledge of past costs invariably stimulates the desire to improve future performance and therefore effects further economy. Man is man and not a mere animal, so he must create an industrial environment which stimulates thinking. Shorter hours and more pay no longer satisfy, for they belong to the class of acquisitive animal stimuli, natural for the animal but unnatural for man. This planet would not sustain one-tenth of its present population of human beings unless man cooperated to create artificially what he needs to sustain life.

To man, therefore, creation is the first requisite. To master the art of creation is a necessity for him. To give our industrial system this new motif is the most fascinating adventure in the world, as no single group of men has more power to accomplish this magnum opus than the cost accountant group.

## Awards to Be Given for Best Brick Buildings in Philadelphia

THE Philadelphia Brick Manufacturers' Association is to make an award of four bronze tablets for the four buildings in Philadelphia and its suburbs, which are selected by its Committee of Award as being those in which the most appropriate and attractive use has been made of brick in Philadelphia. The awards will be as follows: one tablet in triplicate to the architect, the builder and the owner of a private residence costing less than approximately \$10,000; one tablet in triplicate to the architect, the builder and the owner of

a private residence costing over approximately \$20,000; one tablet in duplicate to the designer and the builder of an "operation" house; one tablet in triplicate to the architect, the builder and the owner of an industrial building. The tablets will be suitably designed and each will bear the name of the recipient.

It is expected that the award of these tablets will encourage architects, engineers and constructors of Philadelphia to investigate and become more generally familiar with the characteristics of Philadelphia-made brick, and the

artistic effects obtainable through their use. This idea may well be expanded and put to good use by brick manufacturers in other parts of the country, as well as organizations aiming to increase the artistic development of building construction in cities, and to encourage the use of local materials wherever they are

adaptable to the purpose at hand.

In Philadelphia three men, each of whom is a Fellow of the American Institute of Architects, have consented to act as the Committee on Awards. These members are D. Knickerbacker Boyd, Chairman, Albert Kelsey and Carl A. Ziegler.

## Qualifications of Bidders

### Statement of Qualifications Required by State Highway Department of Kentucky

**T**HE laws of Kentucky give to the State Highway Commission the right to reject any or all bids at a contract letting, and require it in making an award to select the lowest and best bidders, the attention of all bidders being called to this in the advertisement of lettings to be held.

For the past year, in addition to this, bidders whose work is unknown to the Department have been required to file with their proposals a verified and sworn financial statement, a list of equipment, banking reference, and recommendations from those for whom they have performed work. At some of the lettings held in recent months some of the low bids have been rejected on account of non-compliance with these provisions of the advertisement, and award has been made to the contractor that the Commission considered the best experienced and the most responsible. Contractors who have had their bids rejected for these reasons have sometimes seen fit to direct a great deal of censure against the officials of the Department and have felt that they have been mistreated in the matter of award and that preference was being given to other contractors over them.

In defense of this policy, the State Highway Commission has issued a statement to the effect that because an individual or firm is low bidder on a contract at the time of letting, it is no evi-

dence that at the completion of the contract he will have been the best bidder. The Commission feels that it owes it to the public in its selection of contractors to make its awards to those that give the highest type of service, that will inconvenience the traveling public the shortest time, and that will carry on the work with the least amount of engineering supervision.

In order, however, that in the future there shall be no further confusion in the matter of furnishing financial statements, lists of equipment and experience records, there will be attached to each proposal a questionnaire which when properly filled out will show, not only the financial standing of the bidder, but his past record as well. Any bidder not filling out this questionnaire will have his bid disqualified just the same as though he had failed to properly fill out the items embraced in the proposal.

When it is shown that a bidder is not qualified to perform the work he is bidding on, or has not sufficient funds to properly finance the project, he will not be awarded the contract, and no apology will be made to him for the rejection of his bid. The public is entitled to the best service for the money that it invests in highway construction, and such service must not be impaired by the selection of contractors not capable of properly executing the work entrusted to them.

## A Stronger Wheelbarrow with Longer Life

**C**ONTRACTORS have always complained that wheelbarrow trays were not sufficiently reinforced in front. Because of this lack of strength, the nose very quickly folded up and much time was lost by laborers in frequently pounding the nose back into shape. An extended nose brace which is now a feature of Akron wheelbarrows made by the Akron Barrow Company, Cleveland, Ohio, provides the necessary strength to maintain the shape of the front of the tray. This extended brace connects with the top band which is fitted around the edge of all trays, and forms an almost indestructible combination against any weakening of the nose in the tray. It is possible to give these barrows practically any sort of blow without any appreciable bending of this front construction.



## Restricting Competition to Responsible Contractors

Contracts Should Be Awarded on a Basis of Skill, Integrity and Responsibility, with the Policy, Where Practicable, of Eliminating Irresponsible or Inappropriate Bidders Before Their Proposals Are Received

By L. C. Wason

President, Aberthaw Construction Company, Boston, Mass.

At the Conference on a Standard Contract Document, Secretary Hoover's Committee laid down a principle which will eventually be the guide in the selection of those from whom bids are accepted in construction work. The Conference advocated "the award of contract on a basis of skill, integrity and responsibility, with the policy, where practicable, of eliminating irresponsible or inappropriate bidders before their proposals are received."

I am emphatic in stating that bidding should be restricted to responsible contractors. It is appreciated that in accepting this proposition it must be adopted by designers, engineers or architects and approved by the owner, whether he be a private individual or a representative of some public body, before it can be put into effect. Therefore, to start a discussion and to extend it broadly into a field outside of the contractor's is necessary in order to produce the desired results. It must be shown conclusively to the investing public, first by arguments and then by experience, that it is for the best interest of the owner to employ competent men to do his work.

When buying a commodity, it is perfectly proper to compare the article itself with its price and consider it on a price basis, but when buying a building whose exact price cannot be forecast, it is not right to buy it on such a basis. It is not always possible with public invitation to be sure that the bidders are all competent to erect the structure even if it is awarded to them. In this case, what the lowest bidder does is to guarantee that the cost of the structure shall not exceed a certain price, and the supervising designer tries his best to make him build as near to what the plans and specifications call for as is possible. He cannot make an incompetent man deliver good work, nor can he compel one who intends to slight the work to do any more than he is compelled to do, which is often less than the plans and specifications require. The result is that the owner suffers in getting a cheap job which has a high cost of maintenance.

Unrestricted bidding usually results in work's being let at less than it ought to be because the price given is less than it is possible to do the work properly for in strict accordance with the plans and specifications.

When the plan of restricting competition to those who are competent goes into effect, then the work will be awarded at as low a price as is possible to do it properly following the plans and specifications. This class of bidders will

develop organizations which can execute work as cheaply as has been done in the past by the other type who do a poorer quality of work. This we know by personal experience. When this goal is reached, which would be in a short time only, that is, not over two years, after adopting the plan of restricting competition to responsible bidders, the industry as a whole would largely improve by the better quality of work efficiently done, and construction would be raised from the low level of an uncertain trade to that of an honorable profession.

The suggestion is, briefly, to have the designing engineer or architect do in advance what he always does after bids are received, namely, consider the merits and ability of the various bidders. It requires that the designer request each bidder to answer a questionnaire on the three points of skill, integrity and responsibility. If the answers are satisfactory, the applicant is allowed to take a set of plans and specifications and make a bid, and the lowest of these is automatically awarded the contract. If the answers are not satisfactory, the applicant is not allowed to bid. The questionnaire which I would suggest as being satisfactory in eliminating incompetent bidders appears below:

### QUESTIONNAIRE

The following information is for my personal use and will be treated strictly confidentially by me.

Signed..... Architect.

#### SKILL:

1. How long have you been in business as a contractor?
2. How long have you been in responsible charge of work?
3. What training in school, college, or elsewhere have you had to fit you for this business?
4. Give a concise outline of the work you have done, with examples and dates from your start in the contracting business.
5. Give a list of similar work to that in view, with brief description, size, location and date, that you have executed.
6. Have you a skilled superintendent now in your employ competent to be entrusted with executing the work in view?
7. State the training and experience of the man you propose to put in charge of this work.
8. Have you now in your employ the principal assistants to the works' superintendent for the work in view?
9. State their position, training and experience.

#### INTEGRITY:

10. Give the name and address of the last five architects (or engineers) and the owners of the work, with address, for whom you have completed contracts.
11. Will you give them as references?
12. Have you any objection to my inquiring of any or all of them about you?



13. If so, why?
14. Give any other references you care to.
15. Has any work been taken out of your control because of dissatisfaction of architect (or engineer) or owner?
16. If so, describe the case.
17. Have any of your contracts resulted in lawsuits?
18. If so, describe the cases.
19. Have you had controversies with your subcontractor.....or with municipal building departments?
20. If so, state the nature of them?

#### RESPONSIBILITY:

21. I estimate that if you fulfill the requirements of plans, specifications and contract as to progress, the amount of cash and credit required of contractor before first payment is made will be

\$....., and that the maximum requirements of cash or credit in the most active period of the work between payments will be \$.....

22. Have you the required resources in cash or credit?
23. Give a condensed statement of assets and liabilities.
24. What volume of work have you unfinished in \$.....?
25. How much cash or credit does this require?
26. How much cash or credit does this leave free for other work?
27. I estimate approximately that the following plant will be the minimum amount needed to properly handle this work.
28. Have you this amount of your own available for the work?
29. If not, do you know that you can get it as and when needed?

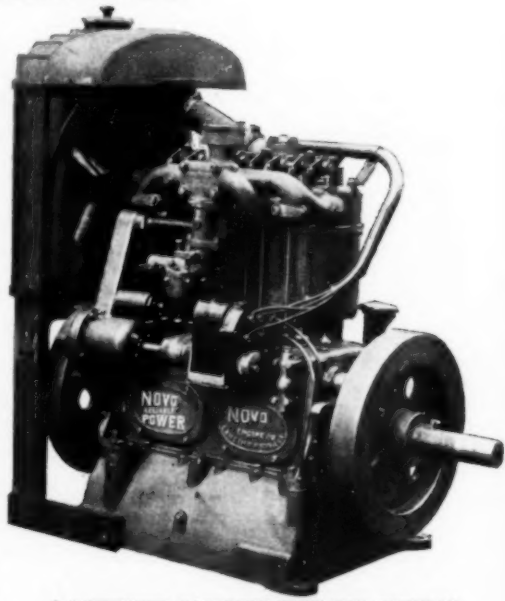
## A New Four-Cylinder Gas Engine for Contractors

HAVING felt the need of, and the demand for, a gasoline engine of higher horse-power, the Novo Engine Company, Lansing, Mich., made a careful and intensive study in the contractors' field of the present need for engines of this class. As a result of this study, this company has put on the market two new gasoline engines of the 4-cylinder, 4-cycle vertical type. This new series will be known as the Novo type F, and consists of Model AF with  $3\frac{3}{4}$ -inch bore and 5-inch stroke, and Model EF with  $4\frac{3}{4}$ -inch bore and 6-inch stroke.

The type F engines are somewhat heavier than the tractor or truck type of 4-cylinder engines. They are slower in speed and have heavier crank-shafts and larger bearings. In short, they are made exclusively for use with industrial equipment. These engines cover the field from 10 to 40 horse-power, and are specially adapted for use with hoists, pumps and air compressors.

In Model AF, the cylinders are cast en bloc with the upper half of the crank-case. In Model EF the cylinders are cast in pairs and bolted to the crank-case. These engines are designed to set on a flat foundation like other industrial engines. They are provided with a substantial base which forms the fuel tank and lower part of the crank-case, containing the oil-pan. The bottom of the base is planed parallel to the center of the crank-shaft.

The following table gives a brief summary of the specifications of these two models:



A POWERFUL GASOLINE UNIT FOR CONTRACTORS' MACHINERY

Model Bore and Stroke	Speed	Weight	Height, Including Radiator	Length	Fly-Wheel Diameter
AF $3\frac{3}{4}$ x 5	850-1000	800	34-inch	36-inch	17-inch
EF $4\frac{3}{4}$ x 6	650-800	1500	56-inch	57-inch	22-inch

## State-wide Radio Service for Highway Department

STATE Highway Commissioner Frank Page, of North Carolina, has installed in his office in Raleigh a radio broadcasting station, and receiving stations in each of the nine district offices located at Tarboro, Kinston, Wilmington, Durham, Greensboro, Charlotte, Elkin, Marion and Asheville. With this equipment the administrative forces of the Commis-

sion will be able to get in immediate touch with the construction and maintenance engineers throughout the state and thus effect a saving of several hundred dollars per month in telegraph tolls and in stenographers' services. North Carolina will go down in radio history as being the pioneer state to use the wireless telephone in carrying out a road building program.

## LEGAL POINTS FOR CONTRACTORS

These brief abstracts of legal decisions in the contracting fields may aid you in avoiding similar difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt, consult your lawyer

**Edited by A. L. H. Street, Attorney-at-Law**

### Contract Void for Lack of Mutuality

In the case of *City of Pocatello vs. Fidelity & Deposit Company*, 267 Federal Reporter, 181, the United States Circuit Court of Appeals, Ninth Circuit, ruled that no enforceable contract arose under the following stated circumstances:

The city contracted with one Mitchell to provide facilities for additional water-supply. But the contract contained a clause to the effect that if the city should fail to sell a certain issue of bonds, the contract might, at its option, be terminated, without any liability to the contractor.

No work was done under the contract by Mitchell, and, on his failing to proceed after notice, the city did the work and sued his surety for the excess cost above the contract price. Holding that there was no liability because the contract had remained wholly unperformed and because it lacked the mutuality required to create valid contract obligation, the Court said:

"Under the contract the option of the city was conditional upon the failure to sell the bonds, and the city had the right to exercise the option of terminating the contract at any time. Had Mitchell proceeded with the work, he would have done so knowing that the city could terminate the contract any time without liability to him in any manner, or upon any account, or upon any claim or demand that he might have had for work he had already done. There is no provision in the contract requiring the city to make an effort to sell its bonds, and no specification as to terms or conditions upon which sale of the bonds was to have been sold. The purpose of the city, as made apparent by the language of article II, was to reserve the right to terminate the contract, provided it did not dispose of its bonds, and in the exercise of such right, to escape any liability to any one upon any claim or demand whatever. A contract of such a nature could not be enforced; it lacks mutuality. There was no performance by either party to the contract and no waiver of lack of mutuality."

### Extra Compensation Under Drainage Contracts

That a contractor constructing a drainage ditch will not be entitled to compensation for extra work entailed unnecessarily through a method of work adopted by him is illustrated by the interesting case of *Seitz vs. Meriweather*, 176 Southwestern Reporter, 160, where the Arkansas Supreme Court decided that contractors having blown excavated dirt away by using dynamite in excavating could not recover pay for extra work involved in refilling ditch.

### When Breach of Contract Prevents Recovery of Compensation

Although it has been frequently ruled by the courts that minor defects in performing construction contracts will not prevent recovery of the contract compensation, less the reasonable expense of making the work conform to strict requirements of the contract, there is a strong tendency to deny recovery by contractors where there has been an inexcusable refusal to perform according to specifications.

This point is well illustrated by the decision of the New York Appellate Division in the case of *Norton vs. United States Wood Preserving Company*, 85 New York Supplement, 886, where it was decided that a paying contractor was not entitled to compensation provided under a contract if there was a willful neglect and refusal to roll the paving after it was laid, as required by the specifications. In that case it appeared that the omission of this phase of performance of the contract resulted in the necessity of relaying some of the paving at large expense to the owner.

### Lump Sum Provision as Agreed Damages for Breach of Contract Upheld

There is a fundamental legal principle applying to construction contracts in general that a provision to pay a stated sum as damages for breach of a contract, inserted in the agreement itself in contemplation of a possible breach, will not be enforced by the courts when manifestly it calls for a sum in excess of actual damages sustained on account of a breach. But in the case of *City of Bristol vs. Bostwick*, 240 Southwestern Reporter, 774, the Tennessee Supreme Court decided that the rule did not vitiate a clause in a contract providing a daily penalty for delay in completing a school building and an auditorium. Says the Court:

"The contractor contends that he should not be held liable in any amount upon the provision in the contract stipulating an agreed per diem payment for delay, for the reason that the same is to be considered a penalty, and solely for the purpose of enforcing the completion of the contract, and for the further reason that the delay was the result of conditions over which he had no control. Considering the nature of the contract, the purpose for which the building was to be used, the public detriment to be contemplated by delay, with the difficulty of approximating the damage thereon, we think the stipulation complained of is a reasonable preascertainment by the parties of the liquidated damages and is not to be regarded as a penalty."

Delay was due to fault of contractor.

#### **Responsibility for Delay in Performing Contract**

Defendant city, and not plaintiff contractor, was chargeable with delay in performing a contract to construct a bridge, where it developed that the specifications were ambiguous and inconsistent, and where the contractor made a bona fide attempt to correct them by submitting new plans, but was delayed in proceeding by the city's engineer's delay in approving the supplemental plans. Therefore, the city was not entitled to terminate the contract under a clause providing for termination in case of the contractor's delay in completing the work without fault of the city. It was so decided by the Connecticut Supreme Court of Errors in the case of *Edward De Tompkins, Inc., vs. City of Bridgeport*, 110 Atlantic Reporter, 183.

#### **Delay Damage Clause in Road Contract Held to Have Been Waived**

Defendant's right to counterclaim damages on account of failure of plaintiffs to complete performance of a road grading contract was denied by the Arkansas Supreme Court in the case of *Brown & Froleys vs. Monroe County Road Improvement District*, 241 Southwestern Reporter, 39.

The contract in question provided for the payment of \$15 for each day's delay in completing the work beyond a certain date. It is held that on account of unfavorable weather conditions it was not the intention of the district to enforce the clause, excepting as an afterthought. Evidence is cited to support a finding that the contractors' delay was sanctioned by the district's representatives.

#### **Conclusiveness of Engineer's Estimate of Road Grading Done**

In the case of *Brown & Foley vs. Monroe County Road Improvement District*, 241 Southwestern Reporter, 39, a contract to recover compensation for road grading, the Arkansas Supreme Court gives binding effect to a clause in the contract reading as follows:

"The engineer shall furnish monthly estimates of the work done upon which partial payments to the contractor shall be based, and, in the absence of fraud or error, his decision as to the value and quantity of work or materials shall be final and conclusive."

#### **When a Contractor May Recover Without the Engineer's Approval Certificate**

Concerning a contract to construct additions to a water-works plant, the United States Circuit Court of Appeals, Sixth Circuit, said in the recent case of *O'Reilly vs. City of Cambridge*, 279 Federal Reporter, 961:

"It is the familiar rule in this class of contracts that, where the ultimate liability is made dependent upon the approval of the engineer in charge, or his certificate, or his final estimate, the contractor cannot recover in its absence unless he shows a waiver of the requirements, or that he was entitled to this certificate, and that it was arbitrarily refused."

"The contract does not provide that the deci-

sion of the engineer shall be conclusive, except so far as that result is implied by the call for 'satisfaction.' It distinguishes between the engineer, with his assistants, who represent him, and the inspectors, who represent the city. The present approval or passing by an inspector would not stand in the place of the final approval by the engineer; but we find no provision which would justify a final failure to approve by the engineer, where there was no ground for his action, excepting alleged defects in the work which at the time, with full knowledge of everything involved, had been inspected and passed as satisfactory by him or his assistants. The contract does not give to the engineer the right to change his mind arbitrarily after he has once acted."

#### **Circumstances Justifying Termination of Construction Contract**

Upholding the action of plaintiff city in terminating a contract for construction of a school building and an auditorium and in assuming charge of the work, the Tennessee Supreme Court observes in the case of *City of Bristol vs. Bostwick*, 240 Southwestern Reporter, 774:

"The contract entered into April 14, 1916, called for the completion of the main school building in October following, and the auditorium in January. In February thereafter neither of the buildings was finished, the contractor was insolvent, and it was apparent that he was unable to complete his undertaking. While it may be admitted that conditions with reference to labor and construction material prevailing during the period within which the work was to be done were such as to impede the progress of the work, yet the delay, as shown by the record, is not attributable to causes exculpating the contractor, but rather to his personal inability to further the construction, as agreed upon."

#### **Road Engineers Upheld in Claim for Preliminary Work**

In the case of *Blackshire & Mercer vs. White-Jackson Road Improvement District No. 1*, 241 Southwestern Reporter, 386, the Arkansas Supreme Court affirmed judgment in favor of plaintiffs on account of preliminary services rendered as road engineers on an improvement project that was afterwards abandoned. Holding that, although plaintiffs were not entitled to the agreed compensation, they were entitled to reasonable pay, the Court says:

"The contract was for the whole of the work, both preliminary and supervisory, and a specified percentage was agreed upon as compensation of the engineers, but the contract was premature because it was entered into before an assessment of benefits was made to determine whether or not the cost of the improvement would exceed the benefits. There was no separate contract for the preliminary work, therefore the compensation of the engineers is to be determined upon the quantum meruit [reasonable value.]"

## A Six-Yard Dump-Wagon

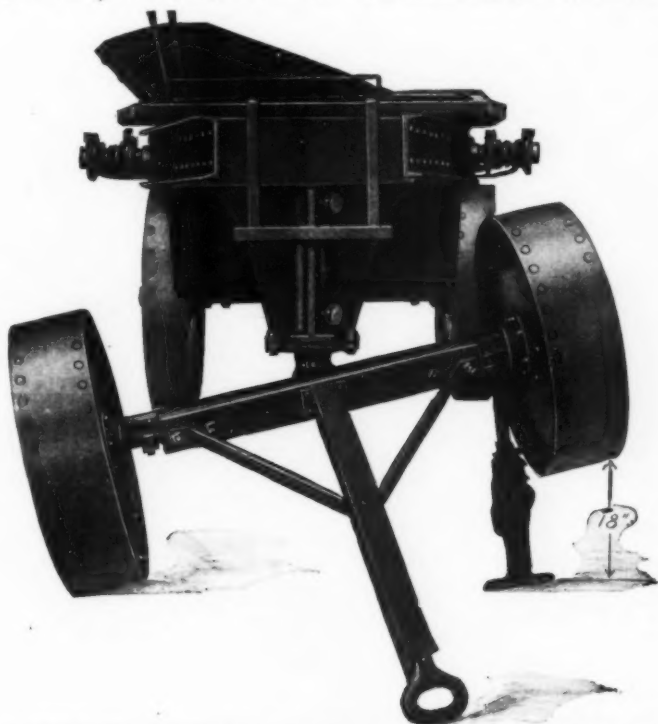
A Boon to Motorized Dirt Handling

**T**HE dump-wagon illustrated herewith was designed for heavy-duty tractor hauling and not as a heavy-duty horse-drawn wagon. It is believed that the wagon fills the demand of successful dirt movers for a motorized grading outfit that will stand up under all conditions and will operate at low speed when loaded, and at high speed without overheating the axle when returning from the dump, because it is equipped with roller bearings.

This wagon is built to carry 6 yards of dirt

the numerous starts and stops necessary to fill  $1\frac{1}{2}$ -yard wagons operated either with team or tractor.

The LaPlant-Choate wagon has a special front axle construction and oscillator, which is claimed to give the wagon greater oscillation than another trailer on the market. It is possible to run down off the road or levee so that there is an 18-inch difference in the height of the wheels without fear of racking the wagon frame or locking the wheels. The steel wheels are specially built, being the re-



**HEAVY TRAILER EQUIPPED WITH OSCILLATOR, PERMITTING GREATER DIFFERENCE IN ELEVATION OF TWO WHEELS THAN WITH ORDINARY WAGONS**

easily on its four broad-faced steel wheels. It is claimed that it is possible to move more dirt in a day with one of these 6-yard wagons than with six 3-horse-drawn type  $1\frac{1}{2}$ -yard wagons, because it is possible to get under the grader belt quicker and easier. Less dirt is spilled on the ground and it is easier for the tractor drawing the grader to make one stop and one start to load a 6-cubic-yard wagon instead of

sult of 15 years' experience. The use of steel wheels on a wagon carrying a load of this size eliminates the chance of bent tires, broken spokes or cracked hubs. The enclosed double roller bearings reduce the draft about 50 per cent. The rollers are straight, not tapered, and therefore run straight ahead with least resistance. The weight of the load is distributed over the entire length of the roller. The one-

piece bearing race can be easily removed and replaced in case of wear. A tapering linchpin is used instead of a nut on axle.

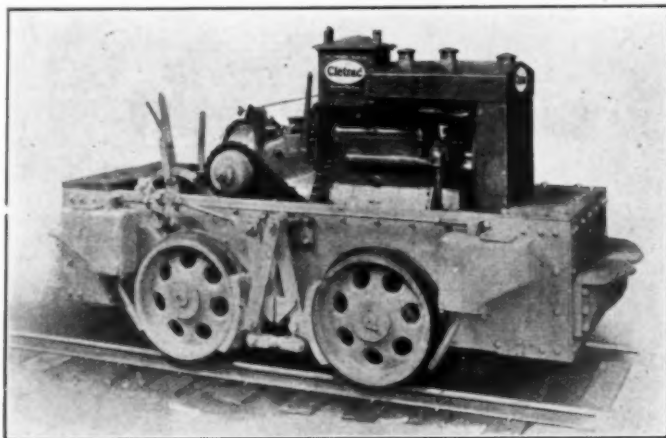
The dirty, tiresome job of jacking up the wagon while taking the wheel off and applying axle grease is done away with. The entire wagon can be greased in five minutes by simply removing the grease plug on the wheel hub and applying a grease gun.

The Byers-Wilson Construction Company, Manchester, Iowa, has been averaging about 250 yards per day with an elevating grader loading into a LaPlant Choate 6-yard wagon hauled by a 5-ton tractor on hauls of from 500 to 700 feet. There has been a notable reduction in wagon repairs, and no time lost through breakdowns. This makes a very satisfactory record.

## A New Gasoline Industrial Locomotive

**T**HE Cleveland Tractor Company, Cleveland, Ohio, has just announced a new gasoline industrial locomotive known as the Atlas-Cletrac. This locomotive is a combination of the Cletrac Model F power-plant and the Atlas

F Cletrac made by the Cleveland Tractor Company, minus its side frames, tracks, seat and steering wheel, is set bodily into the sturdy frame, giving an unusually light, inexpensive and powerful industrial locomotive. For road



THE NEW ATLAS-CLETRAC INDUSTRIAL LOCOMOTIVE

frame and running gear, and has attracted considerable favorable comment among contractors and industrial engineers who have examined it. This locomotive presents a new and unique use for a tractor power-plant. The locomotive is being manufactured by the Atlas Car and Manu-

facturing Company, of Cleveland. The Model construction, industrial railways and general plant hauling, this combined Cletrac Atlas locomotive is claimed to give admirable service at low cost. It has already been in practical service for a considerable period.

## Create Work in Slack Times—Don't Cut Prices

**C.** S. LAMBIE, President, C. S. Lambie Company, Denver, Colo., states that it is not their custom to take work at less than regular rates during slow times, as, by doing so, they find they establish a precedent and create a false value which is hard to overcome when conditions improve. What they do, however, is to endeavor to create business in the slack. During prosperous times building seems to create itself and they are usually offered enough to keep them going without having to go

into the promotion game themselves, but when work is scarce they find that they can very often go out to prospective builders and, by assisting them in a financial way—that is, by getting them the money with which to build and by giving them extended credit—they can very often induce them to go ahead with work which might otherwise be delayed. This is a far better method of promoting work than is that of reducing prices.

—The Constructor.



## Fifth Omaha Reservoir Embodies New Principles in Design

Blanket Concrete in Concentric Courses Allows for Settling

THE organization which operates Omaha's water plant has placed in operation the fifth of a series of water reservoirs built on a design which was untried, in so far as they knew, at the time the first was constructed nearly eight years ago. Fifty-nine million gallons of water are now stored in concrete-lined basins of this design, and the condition of the first is such that the greatest confidence marks the inauguration of the fifth into service. A design embodying new principles, a constructing unit organized to build with painstaking attention to detail and unswerving fidelity to the ideal of absolute perfection of each small unit of the aggregate, has produced a type of reservoir lining that, under the conditions imposed by the local topography and sub-soil formation, has met the desires of the designers.

### Concrete "Blanket" Lining

The lining can best be described as a "concrete blanket," since it is not designed to be inflexible. The bearing soil is excellent, but it was expected that there would be local



RESERVOIR CONSTRUCTION UNDER WAY

settlement, and a lining was constructed with a certain degree of flexibility to conform to these movements.

Six inches of reinforced concrete is placed on the carefully compacted soil base in such a way as to get the nearest possible approach to a perfect bond between successive courses, the steel reinforcing is accurately spaced at the determined height above the bottom of the slab, and the aggregates are mixed in a plant designed to produce a product of as near uniform consistency and composition as is possible.

The aggregate used in Basin No. 7, constructed in the fall of 1921, consisted of a so-called sand-gravel, which might be quite as properly called a coarse sand, since a very small percentage is retained on a No. 4 sieve. The proportion was one part Portland cement to three parts sand-gravel, and to this was added soap and alum as an integral water-proofing. The steel mat consisted of  $\frac{1}{2}$ -inch square deformed bars spaced to give  $\frac{4}{10}$  of 1 per cent of the area of the concrete, both transversely and longitudinally, and was rigidly tied and held so as to have its lower edge 1 inch above the bottom of the concrete.

### Concentric Courses

Concrete was placed in concentric courses around the basin, the width of the course being limited by the height on the slope, which could be placed without slipping. The edges of the previously poured course were roughened where necessary, and all was treated with diluted hydrochloric acid and carefully washed. Finishing



CLOSE-UP VIEW OF THE 10-S SMITH TILTING MIXER DISCHARGING

The power loader and extended track make it possible to take the aggregate from the lower level to the hopper above

was done with wood floated and steel trowels.

The mixing plant was a permanent one, consisting of a No. 10-S Smith tilting mixer driven by electric motor, and the necessary receiving hopper and apparatus for mixing and applying the waterproofing. The mixer was placed on a frame at a sufficient height above the ground to allow two-wheeled buggies to be charged from the hopper, and the elevating loading skip was served by one-horse dump-carts. The loader with extended track takes the aggregate from the lower level to the hopper above. A small boiler was necessary for dissolving the waterproofing soap and alum, and electrically driven pumps handled the pre-

pared tempering water to the gaging tanks.

All aggregates were carefully measured, including the sand-gravel, the cement water and soap. The time of mixing was kept uniform and of sufficient amount, and every precaution was taken to insure the highest possible quality.

Basin No. 7 is 303 feet by 385 feet, and the depth from top of parapet to bottom of mud compartment is 36.5 feet. Its capacity is 20,000,000 gallons. It will serve as a clear-water basin in the present sedimentation system of purification, but is so located as to be used for the effluent from a filter plant. Homer V. Knouse, Engineer of the Water Board of Omaha, was in charge of this work.

## A Safety Code for Contractors

Prepared by the General Contractors' Association of Cleveland, Ohio

### General

**S**UPERINTENDENTS and foremen should feel their responsibility in the endeavor to prevent accidents, and it is their duty to see that tools, equipment and materials used are in good condition.

Use judgment in assigning men to do certain work, and be sure they are capable.

Call attention of men to any dangerous conditions on the job so that they can be on the lookout.

Post conspicuous signs warning the public to keep out.

Post danger signs where necessary.

Station watchmen where necessary.

See that the instructions of the main office as to the proper way of making out accident reports are carried out.

Instruct your men to report all accidents, no matter how trivial. Minor injuries neglected produce most of the infection cases.

The change or increase of any particular hazard, or a new undertaking that increases possibility of accident, should be reported by telephone to the main office.

In case of accident or injury to equipment requiring inspection or repairs, before resuming operations call the main office.

If observation shows evidence of anything more than the most casual hazard to pedestrians or the public, including employees of other contractors, or the owner, notify the head office immediately, so that insurance coverage may be sufficient.

Follow the code—do not take long chances. Men have no right to do so, for others may have to take the consequences. Careless workmen cause accidents—so insist on your men being careful.

See that each employee whose work requires it is provided with and wears a pair of goggles which are suited to the work to be performed and which fit him properly.

Do not give goggles from one workman to

another without their being sterilized. Goggles are classified as follows:

(a) To protect eyes from flying objects and molten metal.

(b) To protect eyes from injurious light and heat rays.

(c) To protect eyes from gases, fumes or liquids.

(d) To protect eyes from dust and wind.

See that you have them on the job.

Respirators should be provided for men working with cement, lime and other dusty material; also in smoky and gaseous places.

### Sanitation

Typhoid fever, dysentery and other diseases are often caused by lack of proper sanitation on the job.

It is essential that adequate and suitable toilet conveniences be provided at the start of operations.

If sewerage is available, connections should be made at once and running water provided to keep closet flushed.

Flush tank closets should be installed where practicable.

A privy is not recommended, but if used, it should be disinfected daily by use of chloride of lime or other suitable disinfectant.

See that all buildings used as temporary toilets are kept in a clean and sanitary condition.

### Drinking Water

Fresh and pure drinking water must be provided. Make connections with city water line, if possible. Drinking bubblers of approved type should be installed when possible.

See that pail and dipper used by water boys are kept clean.

On outlying jobs, if drinking water is obtained from wells or other local sources, its purity should be assured. Have it tested if there is any question.

## Economical Bushing for Concrete Surfaces

**S**PECIFICATIONS on many large concrete construction jobs, such as bridges, piers and buildings, call for the bushing of the surfaces. Architects and engineers recognize that a bushed surface not only adds to the appearance of the construction, but removes the skin cracks on the surfaces which may be the cause of early deterioration. The process of bushing also brings to the surface the aggregate which lends character to the finish. Hand bushing is slow, expensive and unsatisfactory as to finish. In order to meet the demand of the contractor for a mechanical method of concrete bushing, the Thomas H. Dallett Company, Phil-

adelphia, Pa., has designed and placed on the market the Dallett concrete busher.

This busher is made in two sizes, one with a piston diameter of  $1\frac{1}{4}$  inches, suitable for bushing harder or seasoned concrete, and the other with a piston diameter of 1 inch, which is less powerful and better suited for bushing fresh or green concrete. It is also very desirable for use on narrow surfaces such as panels and other ornamentation. The handle is drop-forged and forms the head of the tool, making a natural grip for the hand, and is securely locked to the cylinder by a pawl locking device so arranged that the handle may be easily removed from the cylinder. The barrel is of one-piece turned from solid bar stock, and the air ports are internally drilled, eliminating all plugs. The exhaust comes out at the top of the barrel, and the operator may direct the outlet to his convenience by turning the steel band around the barrel. The piston or hammer is made from selected steel and properly heat-treated to withstand the severe strain experienced by the piston in service.

The bushing inserted in the nose of the barrel is designed with a chisel retaining clip made from tempered spring steel. This feature prevents the chisel from slipping out when the tool is in operation, thus giving the operator the freedom of his two hands in guiding the tool. The bore of the bushing is  $\frac{7}{8}$ -inch in diameter and is of sufficient length to give proper bearing to the chisel shank. The bushing can be removed easily from the barrel when necessary to replace it with a new one. The use of the nine-point chisel brings out on the surface of the concrete the desired finish in accordance with the majority of specifications for bushed surfaces. If a particularly fine finish is desired, similar to the tooled finish of limestone, a bush chisel should be used.

The use of this busher is not confined to bushing concrete, but can be used for drilling holes in concrete, for cutting ducts in concrete floors for electrical installations, and for cleaning brick.



A PNEUMATIC BUSHING HAMMER

## The Road Contractor's Material-Handling Plant

**C**ONCRETE road building is largely a material-handling problem, and the profits rung up by the road building contractor are dependent in no small degree upon the thoroughness with which he has solved this problem.

With the exception of the haul from the mixer to the pouring point, the concrete road-builder's material-handling problem is concentrated on the site of the central mixing plant. He has incoming aggregates to unload from gondolas and store in their respective stock piles, and he has to keep the mixer hopper filled with aggregates from these stock piles.

It would be hard to overstate the importance of providing a material-handling plant of suffi-

cient speed, strength and staying power to insure continuous operation—day and night operation—if necessary. The progress of the entire contract hangs on the capacity of the material-handling equipment. For this reason it is misguided economy to put in a makeshift material-handling installation merely because it is cheap or because the contractor happens to have it on hand. The cheapness of the material-handling plant is never settled until the job is done. Then it may turn out that the contractor would have been infinitely better off if he had given away his old rig and bought one strong enough and big enough to do the job right.

## Reducing the Labor Element in Trench Digging in Clay

**A**NOTHER substitution of mechanical methods for slow and costly manual labor has apparently been made in the use of an air-operated shovel which does the work of ordinary hand picks. By the use of this new tool hand picking can be dispensed with on many excavation jobs, with a considerable saving over former hand methods. On many digging jobs in stiff clay and hard soil for trenches, shafts, tunnels, etc., the ground is not hard enough to be drilled and shot, and yet is too hard to be removed with the ordinary hand shovel alone. Where a large power-driven machine cannot be worked, the usual procedure is of course to employ a gang of men with hand picks to loosen the ground for hand shoveling. The new air tool has been developed by Ingersoll-Rand Company, 11 Broadway, New York City.

In ordinary soil, by the pick-and-shovel method one shoveler serves one man with a pick. With one of these pneumatic diggers, one man can ordinarily loosen as much ground as five men with hand picks, and the rate will average higher than this in the long run. The man with the air tool maintains a more uniform rate of work with fewer pauses for rest, as the work is less fatiguing than swinging a hand pick. The danger of accident from the careless swinging of the hand pick is also eliminated, so that the men are able to work closer together in a trench or shaft.

The new compressed-air-operated tool and its method of use are shown in the accompanying illustration. It weighs only 23 pounds complete and is operated by a man standing in an upright position. It is an air hammer with a cross-bar extension handle, 34 inches over-all length. A digging blade is held in the nozzle end of the hammer by a suitable retaining device. The blows on the hammer drive the blade into the clay or hard ground so that it is pried loose. For clay the blades are approximately 6 by 8 inches, of a slight scoop shape. For earth they are 5 by 9 inches rectangular with a flat face  $\frac{3}{4}$ -inch thick at the top and  $\frac{5}{17}$ -inch thick at the bottom, with the cutting edge beveled from the back.



**A PNEUMATIC SPADE**

The throttle is conveniently located in the grip handle so that the air can be readily shut off as the tool is shifted from one position to another. A buffer inside the retaining nozzle takes the blow if the hammer is operated while the tool is being lifted. An operator, however, soon learns to automatically shut off the air as soon as he starts pulling up on the handle.

## Waterproofing Mass Concrete by the Integral Method

**I**N the article bearing this same title appearing in the July, 1922, issue of the *CONTRACTORS' & ENGINEERS' MONTHLY*, on page 66, no mention was made of the fact that the integral method of waterproofing applies to old concrete construction, as well as to the waterproofing of new concrete work. If it is desired to waterproof old concrete construction, it is only necessary to apply a waterproofed cement plaster coat

over the concrete. In this case the integral waterproofing is used in the plaster coat, which is about  $\frac{3}{4}$ -inch thick and is applied to either the interior or the exterior wall. This integrally waterproofed cement plaster coat can also be used for waterproofing brick, stone or any other form of masonry construction. We are indebted to the Truscon Laboratories, Detroit, Mich., for this additional information.

## Handling Explosives

Notes and Information for Contractors Using Blasting Materials

**I**F explosives are handled sensibly and with due regard to their properties, they can be used with comparative safety. With some consumers, however, familiarity seems to breed contempt, and injury or death is the result. During every stage of the production of explosives those engaged in their manufacture handle them with the greatest caution and respect, but frequently no sooner do the explosives come into the possession of the consumer than they are kicked about, thawed around open fires, the cases opened with a pick, with the sharp point of a rock or by being dropped on the ground.

The Du Pont Company, Wilmington, Del., is doing everything possible to impress the consumer with the fact that carelessness in the handling of explosives is always dangerous and likely to be very expensive. The man who handles dynamite roughly or carelessly, perhaps with a desire to "show off," is not a competent blaster, but a menace and peril to all.

All persons shipping explosives should comply with the Interstate Commerce Commission Regulations for the Transportation of Explosives, copies of which can be secured from the Bureau of Explosives, Underwood Building, New York City. The Federal law provides by



**TEMPORARY PORTABLE POWDER MAGAZINE**

It is not necessary to line these knock-down types for storing blasting powder. For high explosives they must be made bullet-proof with a layer of brick, a sand filling or 4 inches of hard wood. In the South it is well to cell them and add a false roof to keep down the temperature

an act of Congress of March 4, 1909, revised March 4, 1921, in sections 232, 233, 234, 235 and 236 that it is a criminal act:

"To carry, or cause to be carried, any explosives (other than exceptions named) on any train, boat, trolley, or other vehicle carrying passengers for hire; or

"To deliver, or cause to be delivered, to a common carrier for transportation, any explosive under false or deceptive marking, or description on package, invoice or shipping order; or

"To violate, or cause to be violated, any regulation of the Interstate Commerce Commission relating to the marking, shipping or handling of explosives.

"A violation of any of the provisions of this law is punishable by a fine of not more than \$2,000, or imprisonment for not more than eighteen months, or both, or, if injury or death results from such violation, by a fine of not more than \$10,000, by imprisonment for not more than ten years, or both."

Therefore, persons engaged in handling, shipping or delivering explosives should understand that they are personally liable to these penalties, and no instructions should be followed which will cause a violation of the



**STANDARD MAGAZINE FOR STORING POWDER OR BLASTING SUPPLIES**

This is a frame magazine iron covered. The outside appearance is the same as that of a sand-filled high explosives magazine, the only difference being the lighter weight door



above act of the Interstate Commerce Commission Regulations.

The following precautions should always be observed in shipping, storing, handling or delivering explosives, or while near explosives:

A competent person should always be in charge of explosives and of magazines in which they are stored, should keep magazine keys, and should be responsible for the taking of all proper safety precautions. If artificial light is needed, use only an electric flash-light or electric lantern. Do not use oil-burning or chemical lamps, candles or matches. Never allow lighted pipes, cigars or cigarettes near explosives.

Keep constant watch for broken, defective or leaky packages. Do not allow metal bale-hooks or other metal tools to be used. Do not open or re-cooper packages in a magazine. Do not use empty explosive containers, but immediately destroy them. Do not throw packages of explosives down violently or slide them along floors or over each other, or handle them roughly in any manner.

#### Hauling Explosives

When transporting explosives by team or truck, always keep the body of the vehicle thoroughly swept out. When using an open body, protect the load from the sun's rays, rain or snow with a canvas covering. Load the cases of explosives so that they will not shift. Never haul blasting caps or electric blasting caps on the same vehicle with other explosives. In transporting explosives, avoid all unnecessary stops. When necessary to haul through cities, towns or villages, keep off all congested thoroughfares, street car tracks and dangerous crossings.

Do not leave any vehicle containing explosives unless the team is securely tied and the brake set, or, if a motor truck is used, the motor stopped and the brake set. Do not carry metal tools in the body of a vehicle with explosives.

#### Unloading Cars of Explosives

Cars must be unloaded promptly in compliance with the Interstate Commerce Commission Regulations. When cars are opened, retain all seals and make record of the seal numbers. Cars containing explosives should be securely locked or guarded when not being loaded or unloaded. To prevent fire, all leaves, brush and other debris should be removed to a safe distance from the cars.

While explosives are being loaded or unloaded, great care must be taken to prevent sparks discharged by passing locomotives from falling into the car or vehicle containing explosives. Car doors facing parallel tracks should be kept closed at all times. When unloading in railroad yards with parallel tracks on both sides of the car, keep the doors closed when locomotives are passing or are within 100 feet of the car. In unloading cars, comply with the requirements of the cards tacked inside the cars.

When an inclined chute is used, it should be constructed of 1-inch planed boards with side-

guards 4 inches high extending 3 inches above the top face of the bottom of the chute and throughout its length fastened with brass screws. D-shaped strips or runners not more than 6 inches apart and running lengthwise of the chute must be fastened to the upper surface of the bottom boards by means of glue and wooden pegs extending through the bottom board and runners. Chutes may be occasionally wiped down with waste moistened with machine oil, but care should be taken that all surplus oil is removed, to prevent staining the dynamite case. A stuffed mattress, 4 feet wide by 6 feet long and not less than 4 inches thick, or a heavy jute or hemp mat of like dimensions, must be placed under the discharging end of the chute (Interstate Commerce Commission Regulations).

When explosives are being handled between the floor of a magazine and the floor of a car, the runway, if used, should have no exposed metal. All nail heads, bolts or screws must be countersunk and there should be no metal bands around the ends.

Do not place explosives on the ground.

If any packages of high explosives are received in a leaky or damaged condition, put the packages to one side in the magazine and make full report in detail to the manufacturers, giving probable cause of damage.

All placards should be removed from the cars after explosives have been unloaded. After a car containing blasting powder is unloaded, the car should be swept out and the sweepings destroyed by throwing them into water. Notify the railroad company as soon as the cars are unloaded.

#### Storing Explosives

All high explosives should be stored in bullet-proof, fire-proof and weather-proof magazines. If the magazine is suitable for high explosives (bullet-proof) there is no objection to storing blasting powder in such magazine with the high explosives. High explosives, however, should not be stored in a non-bullet-proof powder magazine. Good ventilation is very important in high explosives magazines, but is not necessary in powder magazines; in fact, the elimination of ventilation in powder magazines tends to reduce the "sweating" of the kegs.

Blasting caps and electric blasting caps should be stored in fire-proof and weather-proof magazines properly ventilated. Where large stocks are carried, or where the probability of being shot into is great, the cap magazines should also be bullet-proof. *Never store blasting caps and electric blasting caps in the same magazine with any other explosives.* Keep magazines securely locked when not engaged at or in the magazine. Keep the ground around the magazine clear of grass, leaves, trash, stumps and debris, to reduce fire risk. The magazine should be kept in good repair, and any leaks in walls or roof should be fixed at once. Always ship, deliver or use the oldest stock first. When blasting powder and dynamite are both stored in one magazine, keep stocks piled separately. Dynamite boxes should be stored top side up. Corresponding grades or brands should be

stored together, and in such manner that the brand and grade marks will show. Powder kegs may be stored on sides or ends. It is good practice to pile them with bungs or seams down, as an additional precaution against moisture. Powder kegs should be lifted and shaken in the hands about every two months to prevent caking. All stocks should be stored so as to be easily counted and checked, so that the old stock will move first.

The magazine floor should be regularly swept and kept clean. In case the magazine floor becomes stained with nitroglycerin, scrub it well with a stiff broom, hard brush or mop, with a solution composed of one-half gallon of water, one-half gallon of wood alcohol and two pounds of sulphide of sodium. Use plenty of the liquid, to decompose the nitroglycerin thoroughly.

When magazines require any repairs on the inside of the building, all explosives should be removed to a safe distance and protected. If dynamite has been stored in the magazine and there are any indications of nitroglycerin stains on the floor, wash this portion of the floor before the repairs are undertaken, as instructed above. In making outside repairs, if there is any possibility of causing a spark, fire or explosion, the explosive should be removed to a safe distance from the magazine and properly cared for until the repairs are made. While magazines are being repaired, explosives should be protected from the weather. Do not store them on the ground.

Use a wooden wedge or mallet in opening or closing packages of explosives. Do not have loose dynamite or blasting supplies exposed in any magazine. Do not keep or use any steel or metal tools in a magazine, or store any com-

modity except explosives in a magazine. Do not store any explosives where they are likely to get wet or absorb moisture.

Do not open packages of explosives or pack or unpack explosives in a magazine or within 50 feet of a magazine. Do not leave explosives lying around where children or grown people can meddle with them; always keep them under lock and key in a suitable magazine. Do not store fuse in a hot place. Do not store any explosives in a dwelling, blacksmith shop or barn, or in any other place where, in event of an accident, loss of life or property damage might result.

Do not use a magazine for a thawing-house. Do not store primed cartridges in a magazine, that is, cartridges with a detonator attached. Post magazine rules in every magazine and comply with them.

#### Types of Magazines

Full details regarding the different types of magazines, with plans and specifications, may be secured from any of the manufacturers or from the Institute of Makers of Explosives, 103 Park Avenue, New York City. High-explosives magazines are generally built of brick or of wood covered with iron, with double walls, the space between the walls being filled with sand to make the magazine bullet-proof. When frame sand-filled magazines are used, the entire woodwork is covered on the outside with sheet metal.

Black powder magazines are generally frame buildings covered on the outside with sheet iron. The plans are sufficiently special to warrant anyone in taking the trouble to get plans from the manufacturer from whom he purchases his explosives.

## Improved Galvanized Iron Pails

**I**N line with its policy to maintain its products for the longest period in the most serviceable condition, the Rochester Can Company, 100 Hague Street, Rochester, N. Y., has greatly improved its contractors' pails by additional reinforcement. The pails themselves are made from extra heavy galvanized metal with a heavy band of iron around the top, shaped at either side to form ears. It is also reinforced at the bottom with heavy cross-straps securely riveted in place. These pails have had a very large sale among contractors and builders because of their sturdiness and the way they hold their shape against the rough usage they are bound to receive on the job.

Prices and all other desired information may be secured by any contractors who are interested in the matter, by communicating with the manufacturers at the address above.



**SERVICE IS BUILT INTO  
THIS PAIL**

## A Four-Cylinder Gasoline Road Roller

Equipped to Handle Road Machinery and All Functions of Steam Machine

**T**HE development of a gasoline road roller from a steam machine, using the standard rolls front and rear, making the equipment interchangeable for a machine of similar size and weight, has been accomplished by the Acme Road Machinery Company, Frankfort, N. Y. The big feature in the new Acme four-cylinder gasoline road roller is the substitution of a four-cylinder, heavy-duty Liberty type gasoline motor for the steam boiler and engine. This motor has about three times the horse-power of the ordinary steam engine that has been used in steam rollers.

The gasoline machine is therefore powered

nection with rolling. The work of scarifying is something which has come into general use within the last five years and has developed to a point where the contractor, township, county or state highway department cannot afford to purchase a roller without making this a part of its equipment. Few steam machines are designed to carry scarifiers. The difficulty in redesigning the steam machine to take care of the strain brought about by the scarifier attachment on the water-tanks, fire-box and water connections is apparent. The frame of the Acme gasoline roller is of heavy channel construction, providing a suitable bed support



THE ACME 4-CYLINDER ROAD ROLLER HAULING A PRESSURE DISTRIBUTOR FOR BITUMINOUS MATERIALS

high enough to do the heavy work of scarifying and hauling as well as to furnish ample horse-power as a stationary plant. It is claimed that this outfit will do many kinds of work that the steam machine could not accomplish. By the use of the gasoline motor with its self-starting and generating system, it is possible to start the machine immediately and stop it without loss of time or fuel. A steam machine must be fired about two hours before it can be put to work, and the fire must be maintained all day long with the expense of a man doing nothing but watching the roller for a period of ten hours, when the actual rolling might occupy only two hours.

The whole motor and frame is built with the idea of using the roller for scarifying in con-

for the angles to take care of the scarifier so that all the strain of the work of scarifying comes on this main member and not on the axles or motor or any moving part.

By using a high-power motor, three times the ordinary power required in a 10-ton steam machine is developed. A number of contractors who have been using this machine for over a year state that they would not, under any consideration, go back to a steam-operated roller.

A new scarifier especially designed for road roller work has been brought out to go with this machine. This scarifier uses a two-cylinder application on its scarifier bar, rigidly forcing the entire bar into place when the scarifier is operated. This is run with high air pressure from two storage tanks.

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## ASSOCIATED GENERAL CONTRACTORS

### NEWS NOTES AND COMMENTS

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## Road Maintenance Costs

By W. P. Christie

Research Engineer, Associated General Contractors of America

THE question of five-year maintenance clauses in highway contracts, with special reference to the annual cost of maintenance work on asphaltic types and contingencies to be encountered in this maintenance, was recently taken up with officials of the Bureau of Public Roads, on behalf of a member of this association, who was figuring in submitting a proposal on road work where the price covering such maintenance was requested. The type of road involved was to be asphalt surface on both old macadam and on new five-inch concrete base. A maintenance bond was also required.

In discussing this matter with the Bureau, it was found that there is great variation in the actual cost of maintenance in the various states, as the charges involved are not distributed to standard accounts, and in many instances they include what amounts to reconstruction. Costs also vary greatly on account of the different parts of a highway that may be included in the maintenance clause and on account of the character of work involved. For example, maintenance may include preserving the road surface only, or it may extend to shoulders, ditches and culverts. The contingencies involved in these several cases differ radically and present several elements of danger. A reasonable figure for pure maintenance charges, involving no reconstruction, is given as follows:

Asphalt surface—\$100 per mile a year.

Shoulders—\$150 to \$300 per mile a year.

Ditches and culverts—\$100 to \$200 per mile per year.

These figures represent only a rough average and cannot be safely used on any project without full consideration of the contingencies involved. If the finished surface is narrow, maintenance on the shoulders is apt to run very high, and if the slope of embankment is too steep for the material excavated, the maintenance of ditches and culverts will be excessive. Contingencies of this nature may entail a cost greatly in excess of the figures quoted, and there is always present the danger of a future traffic heavier than that for which the road surface is suitable.

For example, in New Jersey on a certain highway an official of the Bureau of Public Roads cites an instance where the maintenance cost of the asphalt surface, which was placed on an existing road bed, amounted to almost 50 per cent of the initial cost of construction. In

this particular case, as soon as the improvement was completed a great amount of latent traffic in the district developed, while the traffic from other roads shifted to the new highway, with the result that its burden was increased to an extent far exceeding that anticipated by the engineers. As the contractors were bound by this long period maintenance clause, they suffered heavy financial loss, because of kindred contingencies which no one could estimate.

When the surface of this road went to pieces the contractors were forced not really to maintain the road, but to reconstruct it. They were not guaranteeing sound work and pure maintenance, but were guaranteeing the state that its engineers had designed the road properly, and that they had anticipated correctly the amount of traffic that it would receive.

The situation here cited is not as extraordinary as it may seem. In almost any part of the country the completion of a new hard-surfaced road is liable to result in the establishment of new industrial activity and produce a diversion of traffic that will exceed the anticipated wear and tear of the road. Obviously, the wear and tear under these circumstances should not be classed as maintenance, and the expense of it should not be placed upon a construction company; yet this may happen under a five-year maintenance clause. It is worth while to remember that truck transportation is still in a stage of rapid development, and in the course of five years may reach a stage, unless adequate restriction of loads and speeds are provided, where it will break down many existing highways that have been soundly constructed.

If construction companies were to include in their bids a contingent amount sufficient to really protect them against occurrences of this nature, the contract prices would necessarily be exorbitant. It therefore appears that some concerted effort should be made to secure the abandonment of long period maintenance clauses. These clauses are believed economically unsound by a number of officials of the Bureau of Public Roads who have expressed an opinion on the matter, and we are advised that they are not permitted in contracts on Federal Aid projects.

Use of these clauses seems to be confined principally to counties and road districts where it is difficult for opinion, nationally expressed, to effect a change. It is highly essential therefore that this subject be investigated by local

groups of contractors, and presentations made to local authorities which will show them the unsound economics of long maintenance clauses.

The officials mentioned above have stated that they consider it advisable for the state or other political subdivision to take over the road immediately upon completion of construction, and should provide in their contracts merely a clause guaranteeing against faulty construction; even this clause, it is acknowledged, has possibility of injury to the contractor, unless it is limited to a period not exceeding a year. Defects should show up in this time, and under a longer period it becomes frequently impossible to determine whether failure is due to improper construction or inadequate design.

The Bureau advised that a great many counties in numerous states have used the five-year maintenance guarantee. The counties of New Jersey have done considerable work under this clause.

To summarize the results of our discussion with members of the Bureau, the maintenance figures given above, under present conditions, should be considered as a minimum, and should be considerably increased unless the construction company bidding feels sure that they will be held for maintenance only, and not reconstruction; and in either event, it should be considered that the traffic to be carried by the road and the character of the traffic will not increase or change radically during the maintenance period.

#### **A Standard Estimate Sheet for Builders**

A tentative standard estimate sheet for building work through which the Associated General Contractors of America expects to furnish members with not only an estimating guide and reminder, but also with convenient forms of tabulating the different items of construction costs, has been drawn up and is now ready for criticism and suggestions.

A meeting for this purpose will be held in New York, September 11. After this meeting, at which A. G. C. estimators will discuss the forms with W. P. Christie, research engineer, they will be revised in accordance with the criticism and submitted to the Executive Board.

The preliminary work of drawing up the sheet has entailed investigations of existing practices and forms now in use by members of the Association. A great number of these forms, together with information from other sources, have been consolidated into a standard which attempts to incorporate the best practices of each company and locality.

The forms will consist of a general summary sheet covering all the branches and classes of work entering into a building, with sub-summary sheets covering indirect or overhead expense and such classes of work as the general contractor performs. An attempt has been made to suggest all of the items of expense commonly incident to building work, but leaving in the mechanical arrangement of the forms unlimited latitude for the individual estimator to insert any unusual items that may be encountered.

The schedule of items parallels the take-on and is provided with a system of numbers which may be used for cost distribution. When completed, these forms will be supplied to the membership at a price that will compete with the prices paid for plain estimating forms.

#### **A. G. C. Biography**



**H. STANLEY BENT**

*H. Stanley Bent* joined his older brother, Arthur Bent, after the latter had spent many years alone in the construction business. Proving to have remarkable fitness for the work, he stepped from the position of field superintendent into a partnership, which will undoubtedly last. When things are critical, both brothers are frequently in the field for months at a time, and they like it there, as they find more interest in the actual construction work than in the business end. The Bent Brothers have specialized in types of construction having to do with water, such as hydro-electric supply lines, large storm-drains, water-towers, concrete irrigation systems, etc. Among other jobs, they filled the largest irrigation order ever placed—125 miles of 14- to 36-inch concrete pipe, with all the water-handling devices necessary for a great irrigation system covering 15,000 acres of land. They have worked over all the West and in Mexico and as far east as Oklahoma, where they recently installed 7 miles of 42-inch reinforced concrete pipe. They were pioneers in reinforced concrete pipe constructing, but they have done a great deal of other construction work, such as outfall sewers, subways, reinforced concrete chimneys and reservoirs, highways, pumping-stations and tunnel lining.



# Illustrated and Interesting Catalogs

The catalogs and pamphlets listed below are available for free distribution. Contractors and Engineers who check over these pages each month and write for such material as interests them, will find this a valuable means of keeping up to date on the subject of machinery and equipment.

## A COMPLETE CONCRETE ROAD FINISHING MACHINE

The literature of the Dunn Road Machinery Company, Conneaut, Ohio, describes in detail the Dunn Mile-A-Week road builder, which strikes off, tamps and finishes the pavement to a smooth, even surface.

## PAINT—YEARS OF LIFE

In booklet 148-B, the Joseph Dixon Crucible Co., Jersey City, N. J., tells the reasons for the great use of silica graphite paint based on years of life instead of low cost per gallon.

## PROOF OF MIXER'S EFFICIENCY

In catalog 409-D, issued by the T. L. Smith Company, 1019 32nd Street, Milwaukee, Wis., you will find information and proof of the efficiency of Smith pavers, based on their performances for many contractors.

## PAVING ASPHALT

Stanolind paving asphalt, which is regarded as best in many communities in which it is used, is described in detail in a booklet which may be secured from the Standard Oil Co. of Indiana, 904 South Michigan Avenue, Chicago, Ill.

## TRUCK AND WAGON LOADERS

In Booklet 422, the George Haiss Mfg. Co., Inc., 143rd Street and Rider Avenue, New York City, describes its latest developments in the Haiss truck and wagon loader which has proven so successful in handling all kinds of bulk material for contractors.

## STREET CLEANING BY FLUSHING

The literature of the Municipal Supply Co., South Bend, Ind., contains valuable cost data and instructions regarding the cleaning of modern asphalt, concrete, and brick pavements by motorized flushing.

## TAR AND ASPHALT HEATERS

Tar and asphalt heaters that are known the world over for their non-leakable welding and which are made in 10 to 1000-gallon capacities are described in detail in the illustrated literature of Connery & Co., 4000 North Second Street, Philadelphia, Pa.

## A TRACTOR OF MANY SERVICES

In a loose-leaf booklet, "The Monarch Trail," issued by Monarch Tractors, Inc., Watertown, Wis., contractors will find information of great value in making their decisions regarding the type of tractor they should use for logging, clearing and grading operations.

## HEAVY-DUTY CONCRETE MIXERS

Moderate-priced heavy-duty concrete mixers particularly adapted to building construction are described in detail in catalog B-23, which may be secured from the American Cement Machine Co., Keokuk, Iowa.

## STONE SPREADERS SAVE MONEY

The Burch Plow Works, Department E, Crestline, Ohio, tells in its literature how contractors using Burch stone spreaders find that they pay for themselves in their first mile of service.

## A CONCRETE ROAD FINISHER

Illustrated literature completely describing the Maxon concrete road finisher may be secured by writing to the Maxon Co., Milwaukee, Wis.

## HELPING RIGID PAVEMENTS BEAR HEAVY TRAFFIC

The Philip Carey Company, 9 Wayne Avenue, Lockland, Cincinnati, Ohio, will be pleased to send a sample of Elastite and literature telling how this expansion joint helps rigid pavements to bear heavy traffic.

## A DUMP-BODY FOR ONE-TON TRUCKS

The Eagle Wagon Works, Auburn, N. Y., has brought out a new one-ton dump-body especially designed for light trucks, which is illustrated in literature which may be secured gratis.

## THE MIDGET TAR AND ASPHALT HEATER

The catalog of Littleford Brothers, 500 E. Pearl Street, Cincinnati, Ohio, describes in detail its new Midget No. 69 tar and asphalt heater for road and street maintenance.

## SEWER JOINT COMPOUND

Contractors having jobs calling for water-tight sewers will be interested in the literature of the Waring-Underwood Co., Commercial Trust Building, Philadelphia, Pa., describing its "Ideal" sewer joint compound.

## SMALL, USEFUL CONCRETE MIXERS

In catalog D6, the Koehring Co., Milwaukee, Wis., describes its line of Dandie mixers of 4 and 7 cubic feet capacity, operated by steam or gasoline, with low-charging platform and power charging skip.

## A NEW MODEL AUTO CRANE

Contractors interested in an auto crane mounted on a truck and equipped with a one-half-yard bucket should secure the latest literature of the Byers Machine Co., 480 Sycamore Street, Ravenna, Ohio.

## CUTTING DITCHING COSTS

In the literature of the Buckeye Traction Ditcher Co., Findlay, Ohio, contractors will find many interesting data on the use of these ditchers in laying pipe lines through various types of soil, and operating at lower costs than by other methods.

## 3-CUBIC-FOOT CONCRETE MIXERS

The literature of the Archer Iron Works, Western Avenue and 34th Place, Chicago, Ill., describes in detail its new 3-cubic-foot concrete mixer, which can be readily handled with a small crew, and which cuts operating costs.

## AIR-DUMP CAR FOR CONTRACTORS

In the literature of the Kilbourne & Jacobs Mfg. Co., Columbus, Ohio, contractors will find many interesting data on the reliable, efficient, and time-saving service of K. & J. air operated dump cars for industrial and standard gauge railways.

## A PORTABLE PUMP FOR MANY USES

The Canton-Hughes portable pressure pump, which is equipped with an engine and pulley permitting the use of its power for driving a portable saw, a concrete mixer, or a diaphragm pump, is described in detail in the literature of the Chalmers Pump & Mfg. Co., Lima, Ohio.

## WATER-METERS

Catalog A-52, issued by the Union Water Meter Co., Worcester, Mass., describes King meters, which are used in many cities to eliminate the trials of poor meters.

## NESTED CULVERTS EASILY TRANSPORTED

The advantages of nestable corrugated metal culverts are described in detail in the literature of the Chattanooga Road Machinery Co., Chattanooga, Tenn.

**UP-TO-DATE STEAM SHOVELS**

Types of shovels fitted for a great variety of work are described in the literature of the Thew Shovel Co., Lorain, Ohio, particularly describing its type A-1, 0 and 00 shovels.

**SEVEN-TON INDUSTRIAL LOCOMOTIVES**

In the literature of the Industrial Equipment Co., Minster, Ohio, contractors will find an interesting description of the new model F seven-ton industrial locomotive which this company is now manufacturing, 17 of which were used on a single road job in Montana.

**MATERIAL-HANDLING FOR ROAD JOBS**

In the well-illustrated catalog of the Barber-Greene Co., Railway Exchange Building, Aurora, Ill., contractors will find valuable data on the use of the B-G loaders and on the arrangement of concrete road building plants.

**ROAD TRUCKS WITH FOUR WHEEL DRIVE**

Among the recent developments in motor trucks for highway work is the new Road-Building truck described in the literature of the Four Wheel Drive Auto Co., Clintonville, Wis.

**BIG BLAST HOLE DRILLING**

The literature of the Sanderson Cyclone Drill Co., Orrville, Ohio, describes in detail the advantages of big blast hole drilling and blasting over benching, snake holing and gopher drilling in quarry work.

**CABLEWAYS AND HOISTS IN CONSTRUCTION WORK**

The literature of the S. Flory Mfg. Co., Bangor, Pa., describes in detail the advantages of Flory cableways and hoists in all kinds of construction, giving specific examples of outstanding service.

**ROAD GRADING WITH WHEEL SCRAPERS**

The Roytrac All-Steel Multi Unit wheel scraper made by the Smith & Sons Mfg. Co., 1512 Guinotte Avenue, Kansas City, Mo., is described in detail in a special bulletin L-118.

**A TWO-AND-ONE-HALF-TON ROAD TRUCK**

The Nash Motors Co., Kenosha, Wis., has recently placed on the market a two-and-one-half-ton dual body road truck equipped with pneumatic tires, described in a special bulletin, which may be secured free on request.

**A DUMP TRUCK BODY HOIST**

The Columbian Steel Tank Co., 1519-1625 West 12th Street, Kansas City, Mo., makes a motor hoist for motor dump trucks which is described in detail in literature which will be sent gratis on request.

**A STRONGER WHEELBARROW**

Wheelbarrows which have trays reinforced at the front, giving them much longer life, are described in detail in the literature of the Akron Barrow Company, Cleveland, Ohio.

**A 4-CYLINDER GAS ENGINE FOR CON-TRACTORS**

The latest literature of the Novo Engine Company, Lansing, Mich., describes in detail its new model AF and CF 4-cylinder 4-cycle vertical type gas engine, particularly adapted to contracting work.

**SIX-CUBIC-YARD DUMP WAGONS**

In the literature of the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa, contractors will find interesting descriptions of a large capacity dump wagon with wide wheels to enable it to work over rough and soft ground.

**FORM CLAMPS FOR CONCRETE WORK**

The engineers of the Victor L. Phillips Company, Seventh & Delaware Streets, Kansas City, Mo., have developed the Phillips form clamp, which effects a considerable saving in the construction of forms for concrete work, and which is described in literature which will be sent on request.

**A GASOLINE INDUSTRIAL LOCOMOTIVE**

The Cleveland Tractor Co., 19211 Euclid Ave., Cleveland, Ohio, in its latest literature describes a new gasoline industrial locomotive for contracting work which it is making in conjunction with the Atlas Car & Mfg. Co.

**BUSHING TOOLS FOR CONCRETE SURFACE**

The literature of the Thomas H. Dallett Company, Philadelphia, Pa., describes in detail its pneumatic bushing and finisher for surfacing new and old concrete work.

**A 3/4-YARD UNIVERSAL SHOVEL**

The Bucyrus Company, South Milwaukee, Wis., has recently brought out a new 20-ton 3/4-yard revolving steam shovel of distinctly new design. The shovel is described in detail in literature which may be had for the asking.

**STEAM-PUMPS WITHOUT MOVING PARTS**

Complete information regarding the Emerson patented system of unwatering excavations and trenches by steam with the elimination of moving parts will be found in the literature of the Emerson Pump & Valve Co., Inc., Alexandria, Va.

**WRECKING-BARS FOR CONCRETE FORMS**

The Anderson Bros. Mfg. Co., Rockford, Ill., makes several types of bars for wrecking buildings, and for removing concrete forms. These bars of special design are described in detail in literature which may be secured free on request.

**BITUMINOUS ROAD TREATMENT**

A special machine which heats and evenly distributes bituminous material under pressure for road treatment and surfacing is described in detail in literature which may be secured from the Kinney Mfg. Co., 3529 Washington Street, Boston, Mass.

**A HYDRAULIC ASH HOIST**

The literature of the Hydraulic Ash Hoist Company, 835 Springfield Avenue, Irvington, N. J., describes in detail its Centaton Hoist, adapted for schools and apartment houses where a certain amount of water under reasonable pressure may be secured.

**A PORTABLE BAND-SAW**

The literature of J. D. Wallace & Co., 1401-1417 West Jackson Boulevard, Chicago, Ill., describes in detail its new 16-inch band saw, which is equipped with disc steel wheels and other desirable features.

**A CONTINUOUS ROOFING KETTLE**

The features of a new roofing kettle which uses much less fuel than the ordinary kettle and which provides a continuous supply of hot bituminous material are described in detail in literature which may be secured from the Barber Asphalt Co., Land Title Building, Philadelphia, Pa.

**A PNEUMATIC TRENCH DIGGER**

A new air tool for spading soil not readily worked by pick and shovel is described in detail in a recent bulletin issued by the Ingersoll-Rand Company, 11 Broadway, New York City.

**A 4-CYLINDER GASOLINE ROAD ROLLER**

The Acme Road Machinery Company, Frankfort, N. Y., describes in detail its 4-cylinder gasoline road roller in literature which will be sent on request.

**MATERIAL-HANDLING MACHINERY FOR CON-CRETE ROADS**

The circulars of the Portable Machinery Co., Passaic, N. J., describe in detail its portable conveyor, batch box and one-ton dump truck which make an effective material-handling trio for concrete road construction.

**HAND HOIST FOR MOTOR TRUCKS**

A new hand hoist for dumping motor trucks is described in the latest catalog of the Heil Co., 1243 26th Ave., Milwaukee, Wis.

**PORTABLE AIR COMPRESSORS**

Portable air compressors of great value in many types of contracting work and for the operation of rivet cutting machines are described in detail in the literature of Schramm, Inc., West Chester, Pa.

**A COMBINED ROAD DRAG AND GRADER**

In the literature of the Glide Road Machine Co., Minneapolis, Minn., road contractors will find an interesting description of the Jarmin Road Fixer, which has materially aided in reducing the cost of maintaining dirt and gravel surfaced roads wherever used.

**DRAGLINE CABLEWAY EXCAVATORS**

In the latest catalog of Sauerman Bros., 1141 Monadnock Block, Chicago, Ill., sand and gravel producers will find interesting data and descriptions of Sauerman dragline cableway excavators for handling sand and gravel.

**SAND AND GRAVEL WASHING PLANT**

In one of its latest bulletins the Good Roads Machinery Co., Kennett Square, Pa., describes its complete sand and gravel washing plant for the production of aggregate for high-grade concrete work.

**SMALL ELECTRIC SHOVELS**

The operation of electric shovels up to 12 tons capacity handling 3/4, 1 and 1 1/2 cubic yards of material is described in detail in literature which may be secured from the Marion Steam Shovel Co., Marion, Ohio.

**CONCRETE CHUTES FOR SMALL JOBS**

A concrete chuting plant designed especially for small jobs is described in detail in printed matter of the Insley Mfg. Co., Indianapolis, Ind.

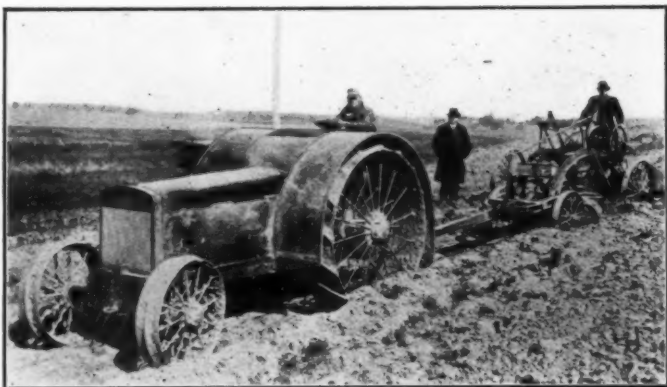
## A Road Tractor with Ample Power

Lowest Grade Kerosene Successfully Used as Fuel

**T**HERE are several features of the Little Giant tractor, made by the Little Giant Company, 231 Rock Street, Mankato, Minn., which are of distinct interest to road contractors and highway engineers. This tractor has a third forward speed which cuts working time in half when the tractor is operating under a light load. It is spring mounted front and rear, with a 3-point suspension which fits it particularly well for work on rough and uneven surfacing. The pull on the road machine which the tractor is called upon to handle is diverted through an enclosed spring draw-bar, which prevents damage to the tractor or its load by any jerk in starting or while in motion.

The drive axles are full-floating and can be reversed to opposite sides when one side of their gear has been worn by contact with the bull gear. All gears and working parts are of alloy steel drop forged, machine cut and heat treated.

The drive wheel lugs are of the Y type, which is claimed to clean better under all conditions than other types. The stem of each fits into the Y of the neck and forms a continuous tread, which prevents damaging vibration on hard surfaces. These lugs have an unusually large traction surface, so that the weight of the tractor is exceedingly light for its power, and it can be operated on any kind of paving, including asphalt in hot weather, without dam-



TRACTOR HANDLING GRADER ON ROUGH GROUND

The draw-bar pulls from underneath the tractor and it is attached ahead of the drive wheel, which prevents any side draft if the load, such as a heavy grader, is pulled at a considerable angle to the center line of the road and out of line with the tractor travel.

The machine is completely hooded in from the weather, the same as an automobile or motor truck. It has a complete unit power-plant, including differential and drive axles. The line of drive in the power-plant is direct, eliminating universal joints. All working parts are protected from dust and damaging elements, and run in solid bodies of oil. Most of them have either roller or ball bearings. The bull gears are of the open or ladder type and clean perfectly under all conditions. They are of the largest possible size and give great leverage on the drive wheels. They are driven from the rear of the drive wheel, a method which tends to prevent the front ends of the tractor from lifting on steep grades with a heavy load.

age to the surface of the roadway.

The fuel system of the Little Giant tractor is such that the motor will handle the lowest grade of kerosene as well as most other motors will handle gasoline, and the manufacturers claim that it will handle kerosene better than any other motor on the market. Because of the saving in power with the use of a unit power-plant, about two-thirds of the motor power is delivered at the draw-bar, as compared with one-third to one-half with some other types of tractor. The Model A Little Giant tractor delivers 26 horse-power at the draw-bar from its 35-horse-power motor. This makes a large saving in fuel and motor oil over tractors with an equal draw-bar horse-power which would require a motor of from 50 to 60 horse-power.

The drive wheels and also the two front wheels are of the bicycle truss suspension type, which enables them to be kept in proper adjustment.

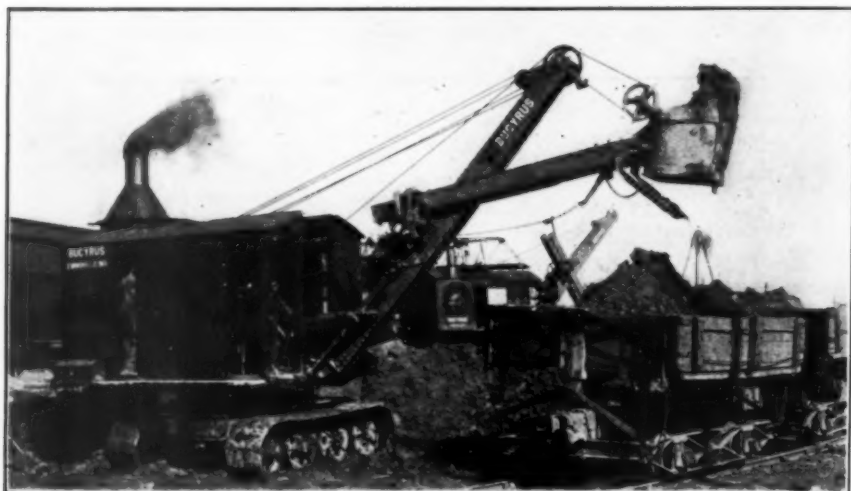
## A New 3-4-Yard Universal Shovel

With Traction Tread and New Features Throughout

A NEW 20-ton,  $\frac{3}{4}$ -yard revolving shovel known as the Bucyrus 20-B "Bullseye," has just been announced by the Bucyrus Company, South Milwaukee, Wis. This shovel replaces the 14-B revolving shovel, which has enjoyed a fine reputation for many years. From boom-point to ash-pan, the shovel is of distinctly new design. For four months the machine has been under test and on actual construction jobs and is now being offered to contractors desiring a distinctly serviceable shovel.

The new machine is claimed to contain a

ability to free itself from sticky material. The dipper latch is double-hinged, preventing bending of the latch or breakage if the dipper should hit the side of a wagon or truck. For operation the shovel is equipped with an improved simplified three-lever control, one lever for independent operation of the throttle and the ram. A release throttle is provided whereby the dipper may be lowered without the need of applying the brake. The shovel is equipped with two speeds; a change from one to the other may be made with one lever, similar to an automobile gear shift. The boiler has a



ON THE JOB THIS NEW MACHINE HAS PROVED ITS WORTH

large number of new and exclusive features not found in other  $\frac{3}{4}$ -yard shovels. These features include a two-part, instead of a three-part, hoist. This arrangement is claimed to be the only practicable way whereby the drag-line excavator can be made as good a drag-line as the shovel is a shovel. Furthermore, wear on the rope is reduced, as a shorter rope is sufficient, and faster digging speed is made possible without sacrifice of power. This shovel also has the outside type of dipper handle and box girder type of boom. This has been proved, through many years of experience on the big 8-yard stripping shovels, to be the strongest possible construction for withstanding successfully the twisting and wrenching strains which are so severe in shovel work.

An improved A-frame is connected to a steel center casting; the back leg, instead of being attached to a structural rear end, is also connected to this casting. The dipper has all four corners rounded, which increases its

larger heating surface and grate area than is usual with  $\frac{3}{4}$ -yard shovels. A unique feature of the shovel is a device whereby the stack may be lowered by power, thus eliminating the possibility of damaging the stack and the rear of the house.

The shovel is interchangeable from caterpillars to trucks or traction wheels. Each caterpillar has only two tumblers and two rollers. These are of large diameter with bearings high out of the mud and water. The driving is through direct gearing to the tumblers, no chains being used. As a demonstration of the effective tractive power of this shovel, it has easily climbed out of a muddy pit on a 20 per cent grade of slippery clay. The shovel is equipped with a new steer, adapted after years of careful study and experimentation. For operation in the pit, where a pit man is always available, a simple and effective hand steer is provided. The clutches are on the outside, where they are accessible and high

out of danger of getting clogged with mud. For moving from job to job, a patent power steering wheel is provided. This device consists of a rubber-tired wheel which is easily and quickly attached to the front of the dipper. Steering is accomplished merely by pointing the boom in the direction of travel.

It is claimed that the 20-B is a superior drag-line excavator. The arrangement of the machinery makes possible a straight lead for the drag-rope. The fair lead affords a vertical as well as a horizontal lead to the rope, reducing friction and rope wear to a minimum. The

standard equipment is a  $\frac{3}{4}$ -yard bucket and a 35-foot boom. The shovel may be supplied with various lengths of booms and handles to adapt it to high lifts for deep basement excavation and other work of this character. For sewer and trench excavation it may be equipped with various combinations, giving it the greatest possible range of usefulness in meeting different needs.

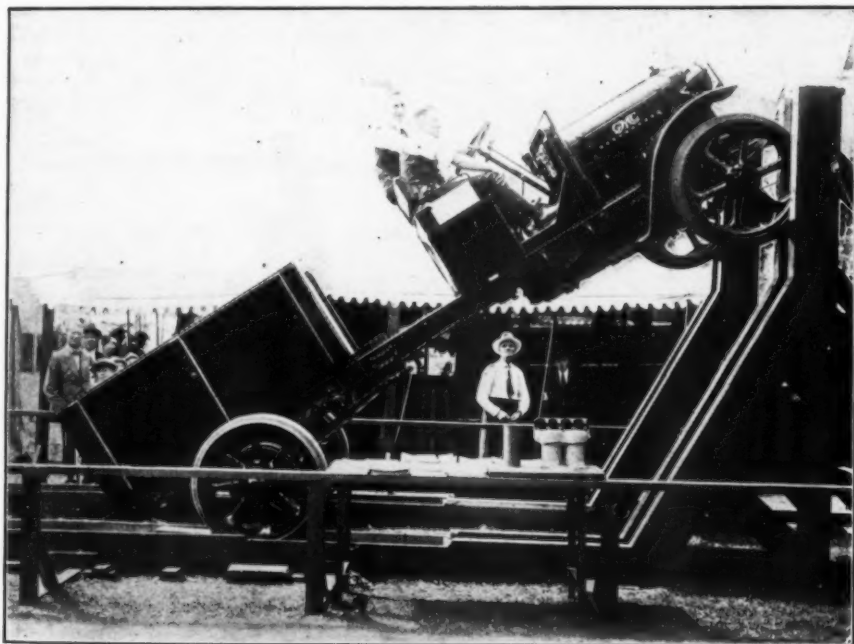
It may also be equipped as a clam-shell or a crane. Electric steel is used in the smaller castings, making possible the most economic distribution of material.

## A Unique Test of a Motor Truck

**A**BOUT the last word in unique tests for motor trucks is the combination ramp and perpendicular wall which has been devised by the General Motors Truck Company, Pontiac, Mich. It is claimed that if a truck will walk up the ramp and then stand on its hind legs until the rear end of the chassis drags on the ground, while the front wheels climb the perpendicular wall, a prospective purchaser can be pretty sure that the truck has about all the power and traction he is ever likely to need.

According to Vance Day, Sales Manager of the General Motors Truck Company, this test was really evolved as the result of an accident.

One of the trucks got off the road and into a sand-bank one day. When the driver started to pull out, he was headed right into a straight wall. He put on the power, and the truck started to climb the wall. It kept on until the rear was in contact with the ground and the rubber on the rear tires started to burn and smoke. In order to demonstrate the pulling power of the two-range transmission of the GMC truck, the combination ramp and perpendicular wall as illustrated has been erected in several parts of the country. When the front wheels begin to climb the wall, there is always a noticeable increase of interest in the demonstration.



A MOTOR TRUCK DEMONSTRATION THAT DRAWS ATTENTION

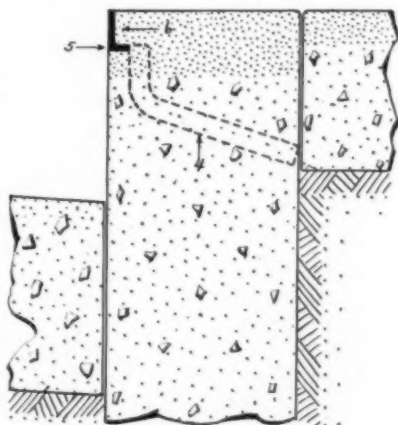


## Steel Curb Guards

### Protective Edge for Concrete Curbs, Platforms and Steps

THE advantage of the concrete curb with a steel protected edge is now an accepted fact. Modern engineering practice has adopted it almost universally. But there have been two serious faults common to most forms of steel curb edging, namely, that they are difficult to install properly and that they are too easily dislodged by the shock of traffic. The Godwin steel curb guard, made by the W. S. Godwin Company, Baltimore, Md., has several distinctive features which make it particularly valuable for guarding the edges of concrete curbs, platforms, steps, etc. This guard has a flat side surface, forcing itself to set rigidly in the forms with no chance for shifting its position. For the same reason it is easily and properly bent for radius corners. The usual frogs and braces necessary to hold some of the other types of curb edgings, both before and after the concrete has set, are not necessary with the Godwin guard, because the anchors of this guard are sheared from the horizontal leg and extend 7 inches into the concrete base, providing extreme rigidity and positive anchorage every 10 inches and near the end of each length of steel guard. These anchors are an integral part of the guard itself. They take the place of perforated flanges and short protruding legs, which provide the sole anchorage for some of the other types of concrete edging and which defeat their own object by obstructing the proper flow of concrete in and around them.

The horizontal leg of the Godwin guard extends into the side of the curb and distributes the concentrated traffic shocks. The heavy shoulder protects the curb from the grind of the steel rims, nuts and tire chains of motor trucks. It is constructed to allow the concrete

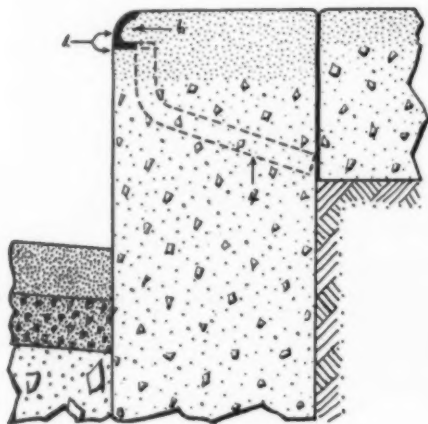


STRAIGHT CURB GUARD

to flow readily around its entire inner surface and also to provide sufficient depth of concrete at the top of the curb to prevent chipping.

Contractors have found that these guards are quite cheap to install properly. The absence of frogs and braces eliminates expense in both material and labor. The absence of diagonal flanges, short protruding legs, perforations, or any such parts around and through which it is necessary to tamp and work the concrete, eliminates a large percentage of labor cost.

In installing this guard the usual steel and wooden forms are filled with concrete to within one inch of the top. The guard is placed with the anchors sunk into the concrete and the top clamped against the outer form at each end. If desired, the guard can be clamped in place before the concrete is placed. After the concrete is placed, worked under the guard and thoroughly tamped, the clamps are removed and the small spaces filled.



ROUND CURB GUARD

#### PUBLICITY METHODS FOR ENGINEERS

American Association of Engineers, Chicago, Ill. 1922. First edition. 207 pp. 65 illustrations. \$1.50.

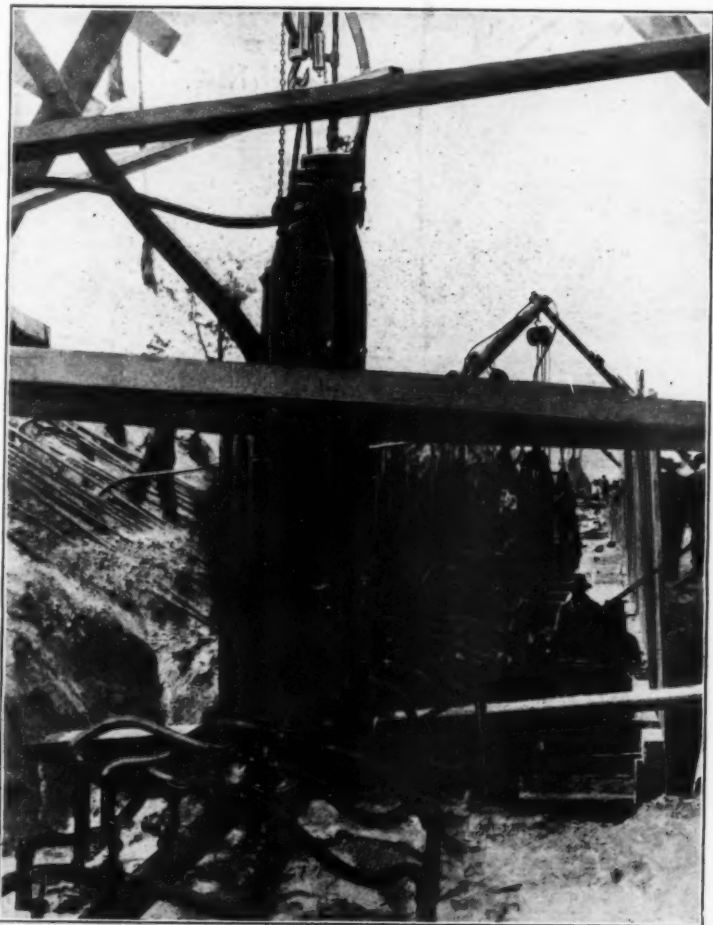
This is the first published book on practical public information methods in engineering fields and is based on the papers and discussions at the First Engineering Conference on Public Information. The book has been carefully edited to conserve the time of the reader, and amended to make a working manual of modern public information methods, used by associations, societies, municipalities, public service corporations, and trade organizations in promoting favorable public opinion rather than commercial products. Its contents cover (1) Some Reasons for Publicity; (2) The Right Construction of Publicity; (3) Ways and Means That Bring Publicity; (4) Getting News in the Newspapers; (5) The Publicity Man and What He Needs to Know; (6) Typical Publicity Problems.

## Steam Pumps for Unwatering Trenches and Caissons

Vacuum Principle for Suction and Pressure Principle for Discharge Produce Efficient Unit

**T**HE patent system of pumping embraced in the Emerson steam pump, which is used for unwatering trenches, caissons, foundations and for other types of work where it is inconvenient to use the usual diaphragm pump, makes use of the vacuum principle for suction and the pressure principle for discharge without the use of any sliding member or other mechanism to separate them. While the water

and steam may be said to be substantially in contact in the pump, there is a sufficient stratum or layer of air between them to prevent the premature condensation of the steam. This pump, made by the Emerson Pump & Valve Company, Inc., Alexandria, Va., is manufactured in ten sizes, ranging in capacity from 75 to 3,000 gallons per minute, based on a 20-foot lift. The Standard type consists of two cylin-



**THIS GROUP OF PUMPS ATTACHED TO WELL-POINTS DEWATERED QUICKSAND SO THAT IT COULD BE HANDLED WITH SHOVELS**

dricial chambers which, filling and emptying alternately, cause the pump to discharge a steady stream of water.

The two vertical chambers which make up the pump are of steel pipe flanged to the base and connected to the top by the operating engine. The purpose of this engine is to admit the steam alternately to the barrels of the pump by the movement of a revolving geared valve. This motion is mechanical and positive and cannot be disturbed by any obstruction in the pump. The valve is steam-balanced by floating in the steam itself and is practically frictionless, only  $\frac{1}{4}$ -pound of steam being required to operate the engine and valve, whether the pump is working against a head of 5 or of 130 feet. The steam enters the cylinder and forces out the water with its layer of air between the steam and the water to act as a cushion to absorb the shock and also prevent condensation. The steam is cut off be-

tween the strokes by the revolving valve, and expands against the air piston head. The water being now absorbed by the steam pressure, this cylinder now contains steam. A spray of cold water is then automatically injected, which condenses the steam, collapsing it and forming the vacuum which causes the cylinder to again fill with water through the suction pipe. The two cylinders operating alternately, each fills with water and clears itself about 15 to 20 times per minute, giving 30 or more discharges and delivering a stream that is practically solid.

The illustration shows how several of these pumps saved the day in a trench excavation job after other pumps had failed and all known methods had been exhausted in overcoming three miles of quicksand at Gary, Ind. The pumps unwatered the sand through the well points so rapidly that it was possible to shovel the sand easily by hand.

## The Danger of Shoddy Building Construction

By Lyman Clark

**B**UILDING construction in the United States involves the annual expenditure of about \$3,000,000,000. The very smallest economic effect upon this expenditure naturally involves a large sum of money, and we may readily afford considerable expense in devising methods for its economic use. As an example, if our annual outlay for building construction can be affected by only such a small amount as one per cent for good or for evil, or one per cent positive value and one per cent negative value, we have the possibility of creating a saving account of 2 per cent or \$60,000,000 annually, which is the interest charge at 6 per cent on a total of 33 $\frac{1}{3}$  per cent of our annual expenditure. With this large saving in mind, is it not worth while to seriously look ahead and devise every possible means for the reduction and prevention of shoddy in building construction?

### Causes of Shoddy Construction

There are many causes for shoddy construction that are traceable to the ownership of property. We look upon property in the sense of invested capital upon which we must seek a financial return. Our constant thought is to develop the property for one purpose or another so that it may make a return on the invested capital. From the standpoint of building construction, the owner is always confronted with the problem of what can best be done with his property from two points of view. He must consider the property in the light of a holding with ever-increasing value, or he must consider it in the light of something to be traded in as an article of commerce. If the owner has adopted the latter consideration, there springs up within our urban and suburban centers an enormous amount of building construction.

There is a cause for shoddy construction if the owner tries to seek a greater earning increment by attempting to build beyond his means.

Without sufficient capital requirements, he often places upon the property a building of the dimensions and contents he desires by utilizing shoddy construction. In other words, he is forced to build beyond his borrowing ability.

It is questionable whether more shoddy is used by those having to do with the actual construction of building than those who are concerned in the ownership of property and buildings. In the construction work, we have to consider the following responsible personnel: (1) architects and engineers; (2) general and sub-contractors; and (3) labor.

There is probably no profession upon which is imposed a greater necessity of knowledge than that of architecture. In the architect's relation to shoddy construction, we may truthfully state that ignorance is the only possible avenue for its introduction. Sometimes this ignorance is due to a "closed ear" on the architect's part, from his inability to receive, or lack of appreciation of, advice, but it is seldom, if ever, the question of wilful introduction of shoddy construction by him, a statement which is not always true of the owner.

### Reduction of Shoddy Construction

While it may be a delicate question to impose upon him who loans funds for building purposes a further consideration than the return of interest and principal, there seems to be a growing consideration that financiers must be more concerned with the question than they have in the past. The mortgagee of property should be concerned not only in the assurance that principal and interest are returned, but that the loan has been wisely and judiciously invested. It should be the duty of one loaning money for buildings to know that the character, kind and quality are the best within economic means. The life of building structures has been variously estimated as being, for cheap frame type-

ments, 10 to 15 years, and for the best structural buildings, from 75 to 100 years. A rate for sinking funds would then be 10 to 5 per cent for cheap frame buildings for a term of 9 to 16 years. In the structural buildings the rate of the sinking fund would need to be only 1 per cent and the term only one-half its life. Therefore, we may reduce the introduction of shoddy construction by impressing upon the owner the economical consideration of building well and, further, by making it difficult to obtain loans for shoddy construction. We may be able in this way to reduce shoddy construction by placing a premium upon good construction.

We have comparatively few cities with what are municipally known as building codes, and none of these codes absolutely prohibit the use of shoddy construction. In the majority of cases they are made for the purposes of creating firewalls, but do not go very far into the character and necessities of good construction. We have various rules for fire protection which more or less define the kinds of material, but, again, these materials are merely to prevent fire hazard rather than to create good construction. While there are inspections of one sort or another for urban and some suburban properties, there does not seem to be much regulation that prohibits or reduces to any marked extent a considerable amount of shoddy construction. Attempts have been made, however, to clarify and unify many regulations imposed upon the building structure. We may therefore hope by this means to greatly reduce shoddy construction in future buildings.

It is possible to reduce the use of shoddy through many educational facilities. Considerable good work has been done along these lines, not only in the technical press, but in popular magazines, newspapers and circulars. That considerably more can be done in our schools and educational institutions there can be no question. The building public should be advised as to the economic advantages of quality materials. Considerable benefit in the building industry might accrue also from visual instruction through the use of motion pictures distributed by manufacturers and others.

Probably no better means for reduction of shoddy is provided than through cooperative efforts stimulated by trade associations. There

has been a tremendous amount of work done by trade associations in setting up useful and economic standards that have materially reduced the waste in building structures. There is still a great deal of work to be done, and it would seem worthy to propose that, wherever possible, various trade associations should be notified by the architectural profession, by the engineering societies, and by various contractors' associations of anything that would tend to reduce the use of shoddy by its removal from the market.

#### Use Only Good Material

We are confronted to-day in the construction industry with the price of labor sufficient to necessitate the use of only good material, and certainly the entire elimination of shoddy material. It is impossible to conceive of paying the prevailing rates for labor for the introduction of shoddy. If one will undertake to examine the material in the market, it will be clearly and easily seen that the use of good material does not vitally affect the cost of building structures. That those concerned with building operations do not examine thoroughly the market price of commodities in planning building structures, must be evident. We, for instance, do not find a marked increase in the use of copper at a price in the neighborhood of 13½ cents, over the use of copper at the price of 26 cents. We do not find a marked increase in the use of rubber at 13 cents over its use at the normal price of 90 cents, or during the war at \$3.30.

In residential building we are confronted with the condition that about one-half the cost goes to labor and one-half to material. Generally, quality may be obtained at an expense of only 2½ per cent of the total cost. Sometimes through the application of knowledge the same is true without any increase in investment.

Shoddy, as meaning waste, must be eliminated if we are to approach any economical refinement. All those concerned in building construction—the banks, insurance companies, merchants, industrials, professions and trades—must interest themselves in every means available for the reduction and elimination of shoddy construction.

ACKNOWLEDGMENT:—From an address before the Civic Development Group of the Chamber of Commerce of the United States.

## P. & H. President Returns from Tour Around the World

**H**ENRY HARNISCHFEGER, President of the Pawling & Harnischfeger Co., Milwaukee, Wis., has returned from a 6-months tour around the world, during which time he visited Japan, China, the Philippine Islands, India and several European countries. The special object of the trip was the investigation of business conditions and possibilities in

the Far East, particularly in Japan, China and India, where this company has branches. Mr. Harnischfeger reports that these countries are suffering from the effects of the world-wide business depression, so that there is a large overstock of materials of all kinds which must be used up before new supplies will be needed for construction work and other undertakings.



THE SALT CRUSHER DOING DUTY ON THE ROAD

## Salt Crusher Used to Crush Pavements

By Alva Goodwin

Hutchinson, Kans.

**A**N oscillatory crushing machine, usually employed to crush salt blocks which have been imperfectly formed in the press, has been used recently in Hutchinson, Kans., to recrush the worn-out bitulithic pavement which was removed from one of the streets and utilized to fill in the road-bed of the Hutchinson Interurban Railway tracks. The crusher was placed on a low truck, as shown in the illustration, with a Westinghouse 323-A railway motor. The current to run the motor was drawn from the trolley wires of the car line by means of a light wire running along a pole.

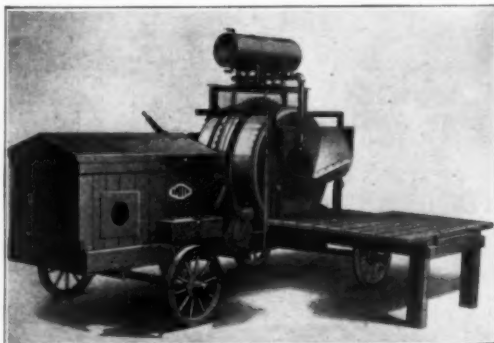
The bitulithic pavement, consisting of a

bituminous material and crushed rock, was broken up very readily when brittle. It was taken up from the streets by large bars and picks and crushed to small particles before being put into the bed of the car-track. The street on which the work was done is being repaved throughout. The Hutchinson Interurban Railway Company is the contractor for the work of removing the bitulithic materials, but the repaving is being done by J. H. Shears & Sons, contractors. The crusher belongs to the Carey Salt Plant and was loaned temporarily, as the street car line belongs to the Carey interests.

## Rubber Tires on Concrete Mixers

**S**INCE the smaller type of concrete mixer requires frequent transportation from one job to another, as it is used in city and town concrete jobs, on building foundations, curbs, culverts, bridge approaches, etc., the T. L. Smith Company, Milwaukee, Wis., has equipped its 7-S mixers with rubber tires. It is found that the rubber tires make the transportation easier and quicker, besides saving unnecessary jarring of the mixer.

Full information regarding the mixers made by this company and the results accomplished by them on various jobs throughout the country may be obtained by addressing the company at 1139 32d Street, Milwaukee, Wis.



SMITH 7-S (ONE-BAG) MIXER WITH RUBBER-TIRED WHEELS





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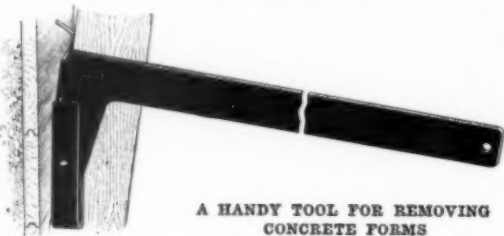
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## Wrecking-Bars for Contractors

**S**EVERAL types of wrecking-bars for taking down concrete forms, for opening crates and boxes, and for wrecking buildings have been placed on the market by Anderson Brothers Manufacturing Company, Rockford, Ill. A great deal of study has been given to the proper design of these bars to make them most effective for the particular service for which they have been developed.

The No. 1 bar, which is about 2 feet long and weighs about 4 pounds, is drop-forged from good steel, and the claw end is tempered. It is used by carpenters and contractors, as it possesses distinct advantages over ordinary bars, because a solid hold can be secured with the projecting lug, and with the leverage of a 2-foot handle it is easy to pry off the board, in addition to pulling the nails straight.

The No. 2 bar, which has been particularly developed for taking down concrete forms and for wrecking buildings, has a pivoted toggle, as well as the projecting lugs of the No. 1 bar. The toggle permits boards to be pried off with a greater saving of lumber in less time and with less energy. When taking down concrete forms, the toggle is held stationary against



**A HANDY TOOL FOR REMOVING  
CONCRETE FORMS**



**A USEFUL BAR FOR CARPENTERS  
REMOVING STAGING, ETC.**

the form, and the lug catches in back of the piece being removed. Tongue-and-groove lumber can be pried off without breaking the match. This bar can be also used where boards can be taken down from the inside, and with it there is no need of scaffolding. It has a 3-foot handle and weighs about 8 pounds.

A still heavier wrecking-bar with a 4-foot handle, the total weight of which is 14 pounds, is also made by this company, and is known as its No. 3 bar. This is used for pulling off heavy braces and for the harder work of wrecking buildings and taking down concrete forms. The projecting lug furnishes a solid pry for the 10 to 1 leverage of this bar. The leverage is so great that a board held by many nails is readily pulled off.

## Foremen Hired on Straight Time

**L**LOYD B. SMITH, President, Topeka Bridge & Construction Company, Topeka, Kans., reports in a recent issue of *The Constructor* that his company tries to keep foremen on straight time the year round. The other men they are unable to keep in this way. Most of them are common labor, however, which is picked up near the location of the bridges. They try to have one or more jobs further south for the winter work. The foremen who are shut out in northern latitudes in cold weather are sent down on these jobs during the winter time and brought back in the spring as the work requires. Beyond this, they have been unable to do much to guard against seasonal unemployment. They keep their tools and equipment re-

paired as they come to the shop from different jobs, and do not find it practicable to hold these over for repair during the winter time. They do not carry much concrete work through the coldest weather, as they find it more expensive when the materials have to be heated and the concrete protected. The owner is not generally willing to pay this difference in cost, and they have not been able to offset the expense much by hiring labor cheaper in the winter time, as the Kansas State Labor Commission and other organizations will not allow this reduction for winter work. This forces the contractor to make up the difference between the cost of carrying out contracts in winter and in summer.

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## SPAVINAW WATER PROJECT---TULSA, OKLAHOMA

### NOTICE to CONTRACTORS

Sealed proposals for the construction of the major portion of the Spavinaw Water Supply Project for the City of Tulsa, Oklahoma, will be received by the Water Commission of the City of Tulsa, and may be filed at the office of the City Auditor, City Hall, Tulsa, Oklahoma, until 3:00 P. M. Monday, September 25th, 1922, and will be opened and publicly read immediately thereafter at a regular meeting of the Water Commission of the City of Tulsa at 3:00 P. M. Monday, September 25th, 1922. Proposals will be received on the following contracts:

- |  |   |   |
|--|---|---|
| Contract No. 1. Telephone Line                 | Contract No. 6. 54" Reinforced Concrete Pipe                    | Contract No. 9. Furnishing Gate Valves          |
| Contract No. 2. Clearing Site of Spavinaw Lake | Contract No. 7. Mohawk Reservoir                                | Contract No. 10. Laying Cast Iron or Steel Pipe |
| Contract No. 3. Spavinaw Dam                   | Contract No. 8. Furnishing Cast Iron or Steel Pipe and Specials | Contract No. 11. High Pressure Reservoir        |
| Contract No. 4. 80" Reinforced Concrete Pipe   |   |   |
| Contract No. 5. Tunnel and Approaches          |   |   |

After the reading of the bids on these contracts they will be immediately considered, but in no event will any contract or contracts be awarded earlier than forty-eight (48) hours thereafter.

The principal quantities are approximately as follows:

- DAM:** Concrete, 79,000 cubic yards.  
Earth Embankment, 182,000 cubic yards.
- PIPE:** 28 miles of 60" and 25 miles of 54" pre-cast reinforced concrete pipe.  
Earth Excavation in trench, 310,000 cubic yards. Rock Excavation in trench, 26,000 cubic yards.
- TUNNEL:** 7,000 ft. 84" Tunnel. 3,050 ft. 84" monolithic concrete conduit.
- MOHAWK RESERVOIR:** 300,000 cubic yards earth embankment.

**REINFORCED CONCRETE HIGH PRESSURE RESERVOIR; OR RESERVOIRS:** 10,000,000 gal. aggregate capacity.  
10,000 ft. 36" Cast Iron or Steel Pipe. 8,000 ft. 30" Cast Iron or Steel Pipe. 8,000 ft. 20" Cast Iron Pipe. Specials and Valves.

Each proposal must be accompanied by a certified check on any reputable bank or trust company, payable without reserve to the City of Tulsa, Oklahoma, for five per cent (5%) of the amount of the bid.

All proposals must be made on blank forms furnished by the City of Tulsa and in accordance with the "Requirements for Bidding and Instructions to Bidders."

Proposals may be tendered on one or more contracts or on all of the contracts, but any proposal must include all items under the contract or contracts for which bid is tendered.

Plans, Specifications and Requirements for Bidding and Instructions to Bidders, are on file at the Office of the Water Commission, at the City Hall and may be seen at the office of Trammell and Holway, Engineers on the Spavinaw Water Supply Project, 329 Kennedy Building, Tulsa, Oklahoma, or at the office of Dabney H. Maury, Consulting Engineer for said Project, 1445 Monadnock Block, Chicago, Illinois. Complete plans and specifications will be furnished by the Engineers or by the Consulting Engineer, upon the deposit of \$50.00 by check payable to Trammell and Holway. Upon return of the plans and specifications in good condition within a reasonable time after the awarding of the contracts, \$30.00 will be refunded. Proportionate deposit and refund may be arranged for if bidder desires only parts of the plans.

The Water Commission reserves the right to reject any bid or bids, or all bids, and to waive any informalities.

#### WATER COMMISSION OF THE CITY OF TULSA,

A. J. Rudd, Chairman; G. R. McCullough, C. S. Avery, H. L. Standeven, A. L. Farmer.

**TRAMMELL AND HOLWAY, Engineers,**  
329 Kennedy Building, Tulsa, Oklahoma.

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# Distributors of Contractors' Equipment

THE following cards (arranged by states) show the names of dealers in contractors' equipment and supplies with a record of the various lines handled. Contractors will find this list a convenient means of getting in touch with dealers who make a point of giving satisfactory service and prompt shipments. This directory is constantly consulted by our subscribers and any suggestions regarding it will be welcomed.

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"RANSOME" Concrete Mixers  
"HAISS" Portable Loaders  
"CLYDE" Derricks, Hoists  
"ERIE" Steam Shovels  
"KENNEDY" Crushers  
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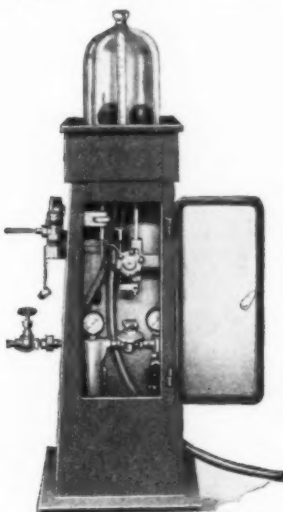
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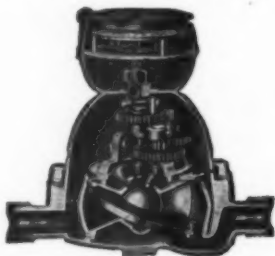
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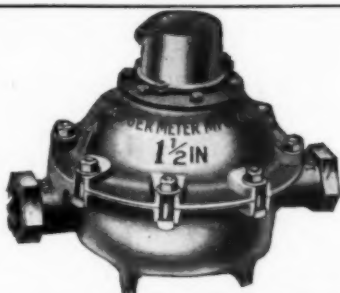
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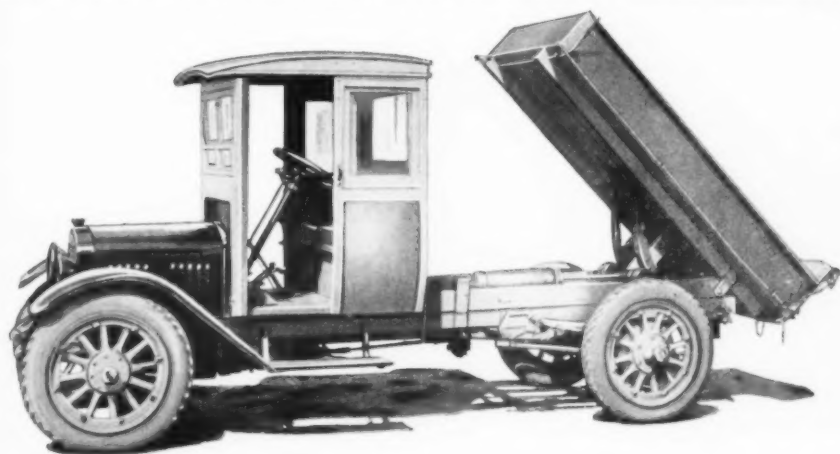








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